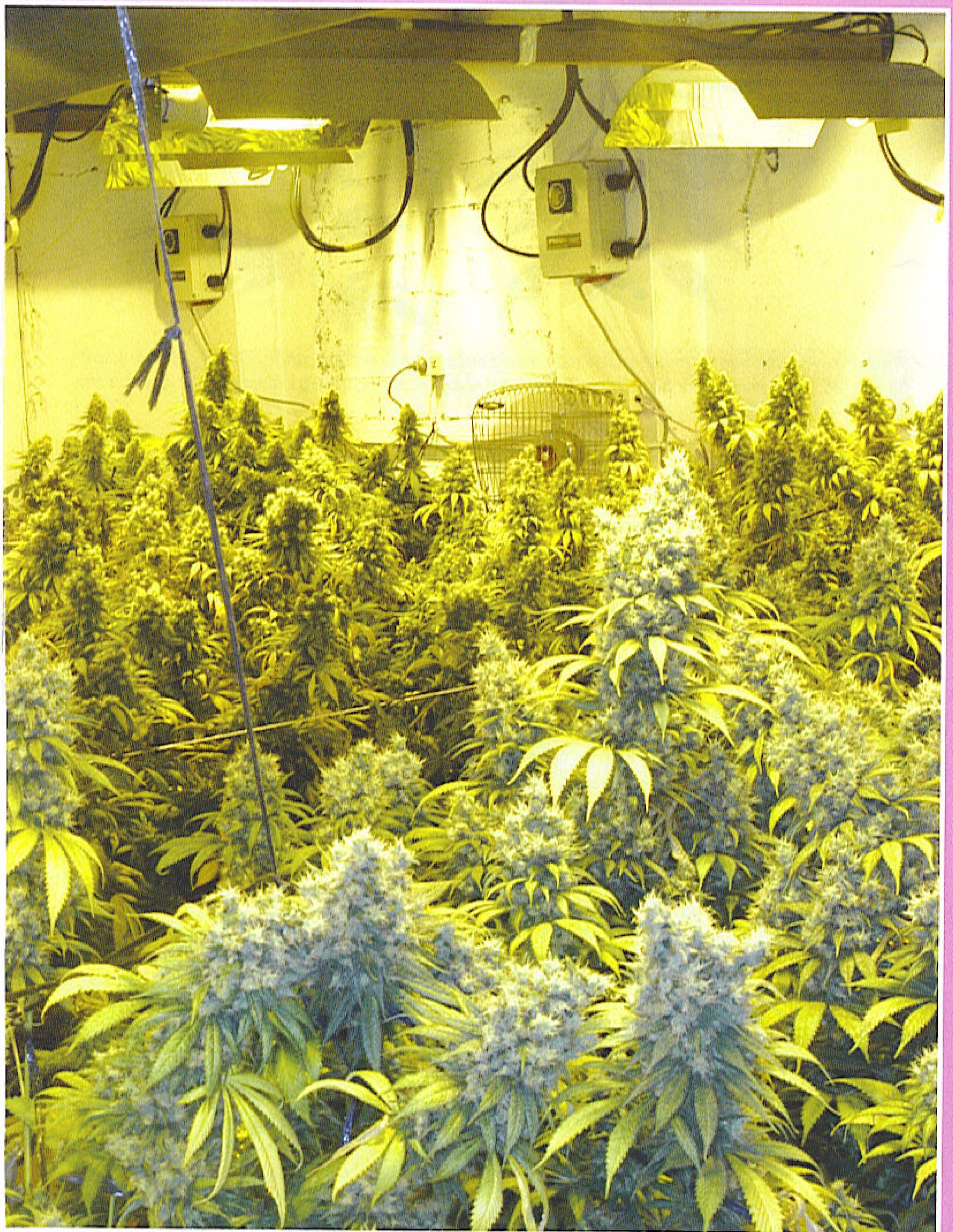


Phyllotaxy - Branching changes when a seedling enters the flowering stage. The vegetative plant on the left has symmetrical branching. Branching changes to asymmetrical when plants enter the flowering growth stage.

Life Cycle

Cannabis must flower and produce seeds to successfully complete its annual life cycle. Marijuana is a dioecious plant, being either male (pollen producing) or female (ovule producing). However, hermaphrodite (bisexual) plants with both male and female flowers can also occur.

Plants grown from seed support symmetrical branches during seedling and vegetative growth.

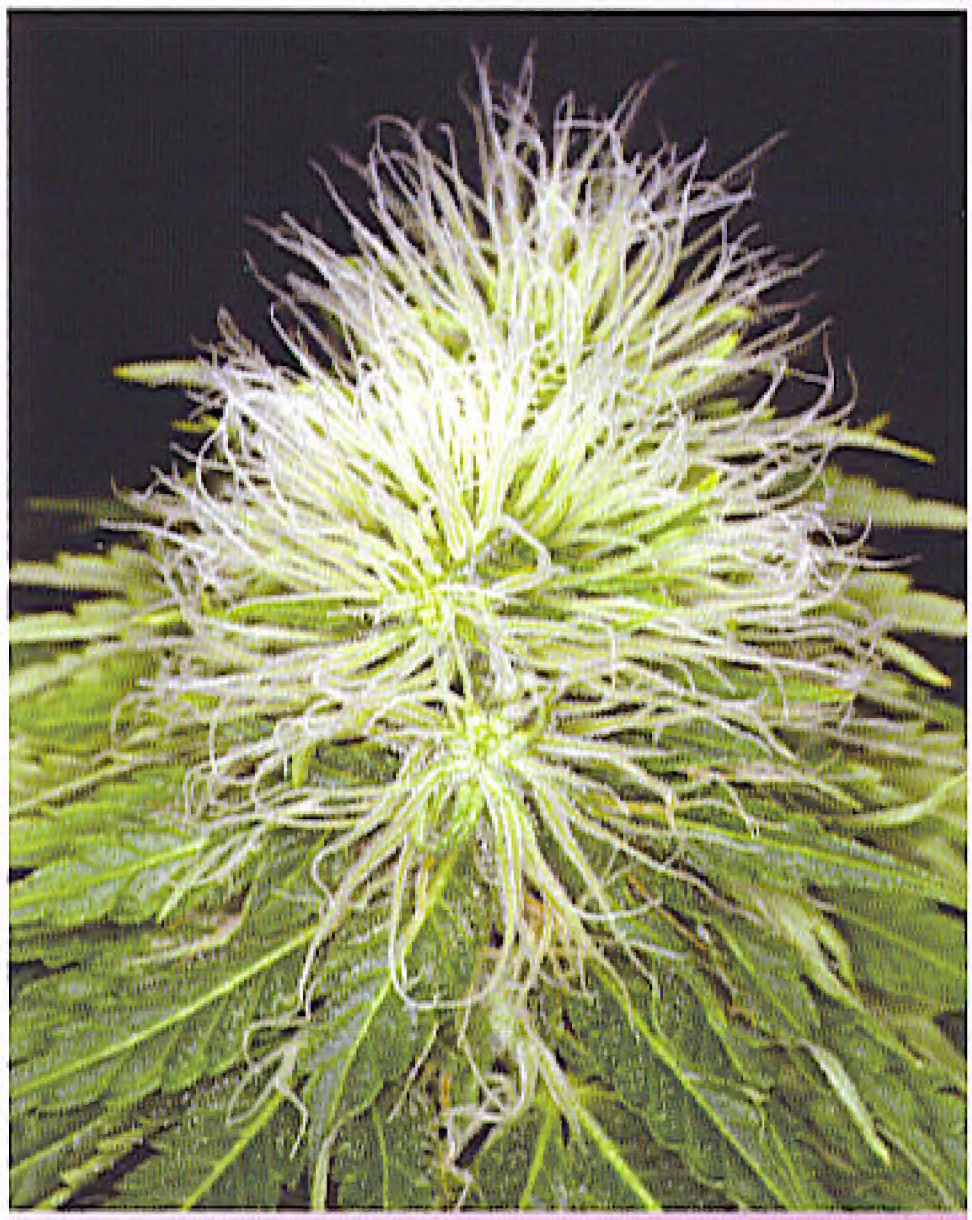
In nature, cannabis flowers in the fall, after the long hot days of summer. The long nights and short days of autumn signal marijuana to start flowering. Plants are normally either male or female. Cannabis produces male or female pre-flowers after four weeks of vegetative growth. For more information, see "Pre-flowers," below.

Growth patterns and chemistry change during flowering: stems elongate; leaves grow progressively fewer blades; cannabinoid production slows at first then accelerates; and flower formation is rapid at first then slows. Nutrient needs change as growth stages change. Plants

Asymmetrical branching occurs as plants grown from seed begin to flower.

focus on flower production rather than vegetative growth. Green chlorophyll production, requiring much nitrogen, slows. Phosphorus and potassium uptake increase to promote floral formation. Shortly before the flowering stage, growers change to a "super bloom" fertilizer formula with less nitrogen and more potassium and phosphorus.

Induce flowering in greenhouses, outdoors, and indoors by giving plants more hours of total darkness and fewer hours of light. Give cannabis 12 hours of uninterrupted darkness and 12 hours of light to induce visible signs of flowering in two weeks or less. This program is effective in all but the latest blooming pure *sativa* strains. Growers with a vegetative room illuminated 18-24 hours a day and a flowering room with 12-hour days and 12-hour nights, create environments that mimic the photoperiod in summer and fall. With this simple combination, growers crank



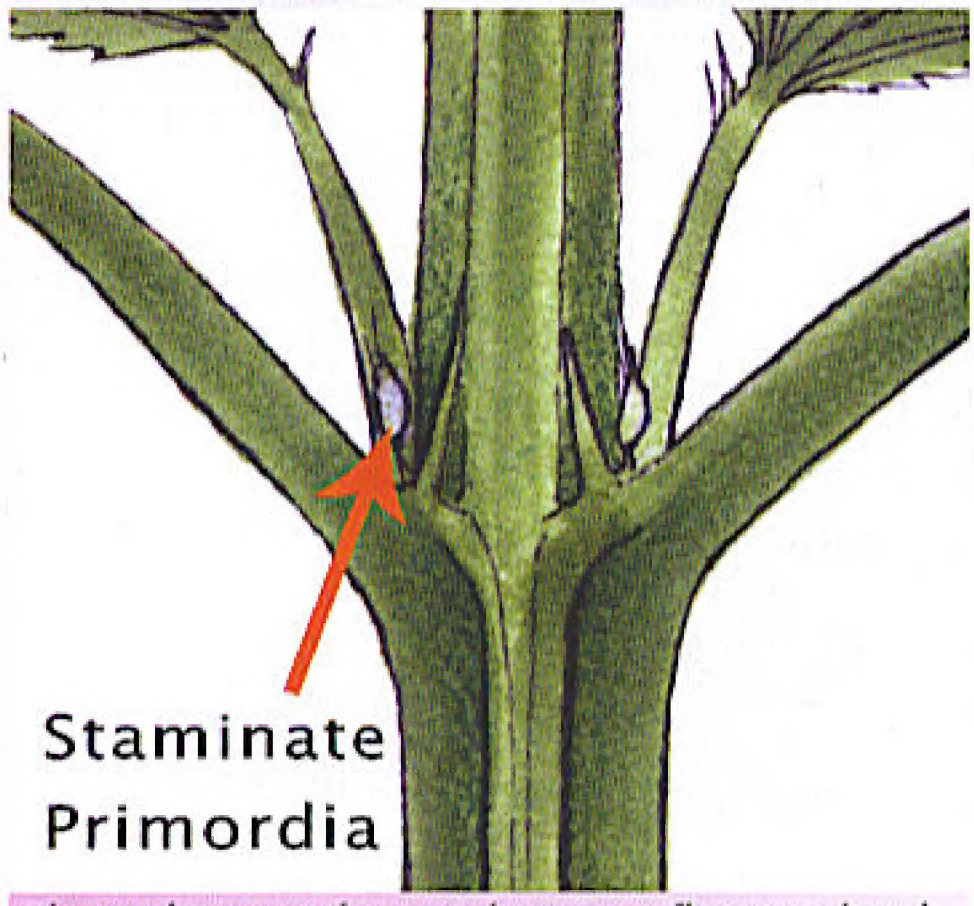
The top of this bud from an unknown strain is a mass of white, fuzzy, hair-like pistils.

When a low-nitrogen super bloom fertilizer with more phosphorus and potassium is used, fan leaves yellow during flowering.

This flowering male plant is in full bloom. Pollen-laden flowers continue to open and shed pollen for two weeks or longer.

Image shows a male plant after 24 days of vegetative growth at 18/6 day/night. Staminate flowers are located at the node between the stipule and emerging branch.

This is another view of the same pre-flowering male plant so you can get a better view.



The red arrow shows where pre-flowers develop on both male and female plants.

out a crop of outstanding buds every six to ten weeks all year long.

Inducing flowering in cannabis grown from seed with a 12/12 day/night photoperiod will cause plants to show sex, male or female. Once the sex of the plant is guaranteed, males are almost always harvested before they shed pollen, and females are coaxed into higher yields. Once the photoperiod is set, disrupting it will cause plants to suffer stress. If they suffer enough stress, hermaphrodite tendencies increase.

Water intake of flowering plants is usually somewhat less than in the vegetative stage. Adequate water during flowering is important for plants to carry on internal chemistry and resin production. Withholding water to "stress" a plant will actually stunt growth and diminish yield.

Removing large fan leaves to allow more intense light to reach small buds or to stress plants is crazy! Large leaves are necessary to keep plants healthy. Indoors and in greenhouses where the hours of darkness are controlled, cannabis flowers for six to ten weeks or longer. This is a very short time. Hacking off branch tips to initiate more budding sites diffuses floral hormones and retards growth. Remove only leaves that are 50 percent or more damaged by diseases, pests, and cultural practices.

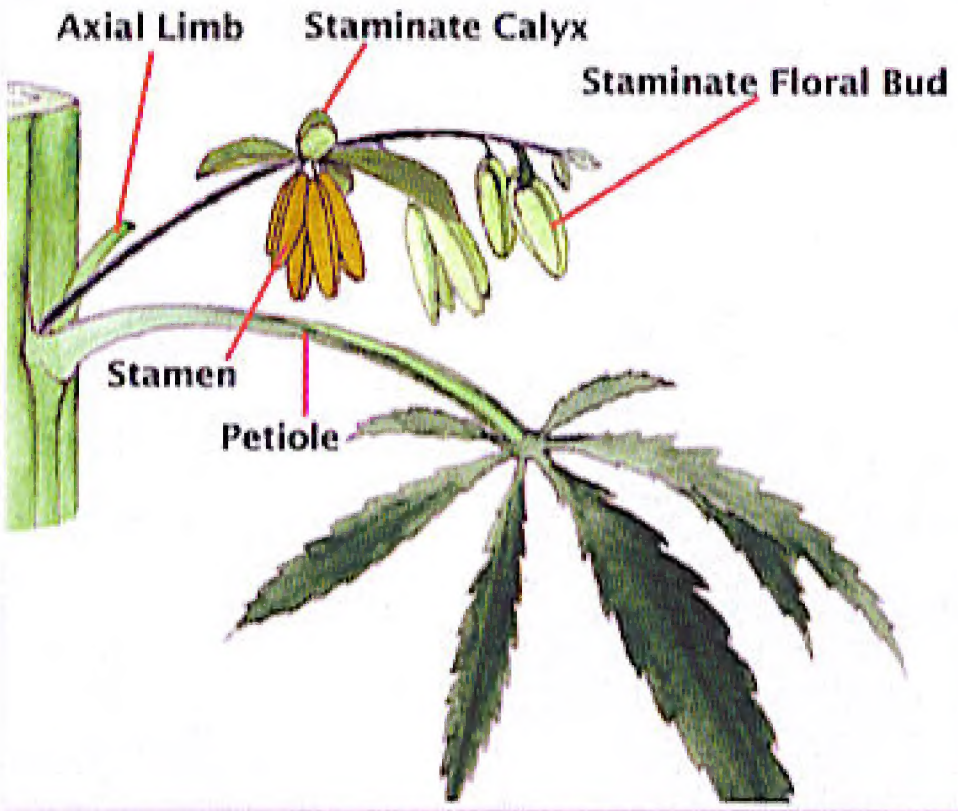
Upon pollination, one of the many, tiny grains of pollen from the male (staminate) flower pod, lands on a pistil of the female (pistillate) flower. Female flower tops are a mass of calyxes with each calyx harboring an ovule and a protruding set of pistils. Actual fertilization takes place when the grain of male pollen slides down the pistil and unites with the female ovule deep within the female calyx. Once fertilization takes place, pistils turn brown and a seed forms within the seed bract. Seeds are the result of this sexual propagation and contain genetic characteristics of both parents. In nature there is

a 50/50 chance for a seed to produce a male or female plant. Once fertilized with male pollen, female plants put the bulk of their energy into producing strong, viable seeds. When flowers are full of ripe, mature seeds, the female will die, having successfully completed her life cycle. The male completes his life cycle and dies after producing and dispersing all of his pollen into the wind, in search of receptive female pistils.

Pre-flowering

Pre-flowers, described by Robert Clarke in *Marijuana Botany* as "primordial," are the first indication of a plant's sex. The pre-flowers grow at branch internodes just behind the leaf spur or stipule about the fourth week of vegetative growth, when the plant is six to eight weeks old. This is the point of sexual maturity, the first sign a plant is preparing for flowering–the next stage in life.

You can see pre-flowers with the naked eye, but a 10 to 30X magnifier will make viewing easier. You can accurately determine plant sex after eight weeks. Using this method, you can distinguish sex before inducing flowering.



Botanical drawing of all male parts and overall view of the male flower.

Early male flowers are easy to spot with the naked eye. They are located at branch internodes.

Male

Male Pre-flowering

Male pre-flowers are normally visible when plants are six to eight weeks old, after the fourth week of vegetative growth. The pre-flowers emerge behind the stipule at the fourth to fifth branch internodes and generally do not turn into full flowers. But, according to Bongaloid (www.overgrow.com), "a male plant will develop mature staminate flowers after prolonged periods of vegetative growth."

Always wait to induce flowering until after pre-flowers appear. Inducing flowering with 12 hours of uninterrupted darkness and 12

Male pollen sacks hang like little balls. Each pollen sac has enough pollen to pollinate all the females in the average grow room.

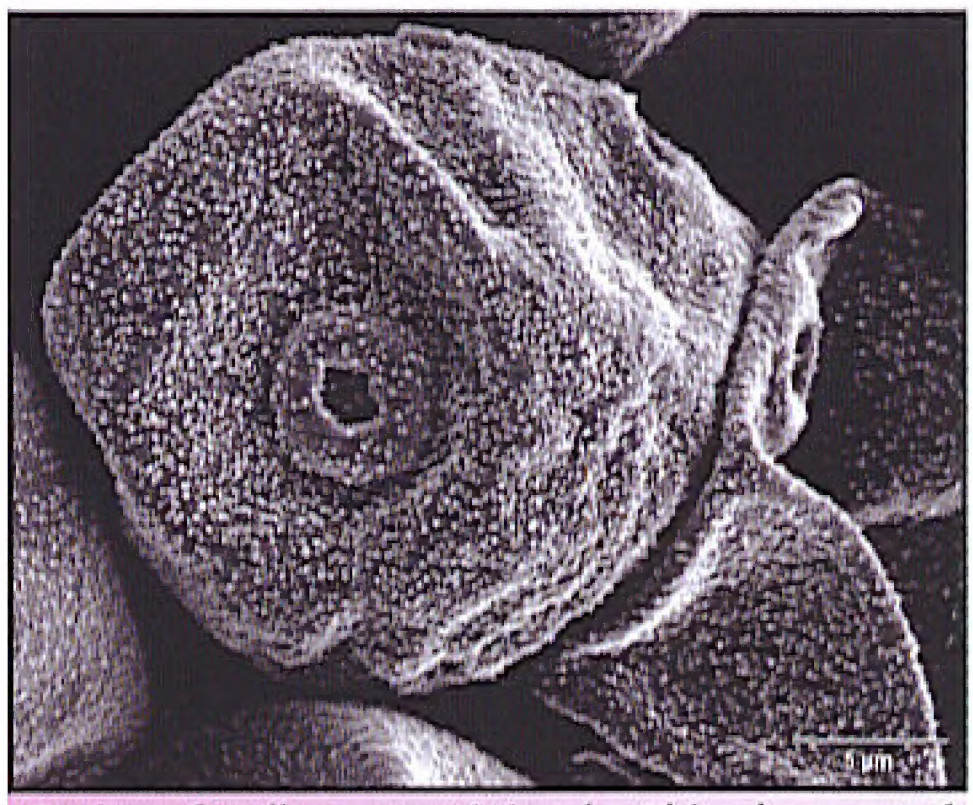
Male flowers develop quickly on the tip of this male plant. Keep an eye out for male plants, and separate them from females as soon as they are spotted.

This male plant is in full bloom. Flowers open over the course of a week or longer to ensure females are completely pollinated.

hours of light before pre-flowers develop will stress the plant. This stress could cause peculiar growth, and plants might develop into hermaphrodites. Inducing flowering before pre-flowers form will not expedite flowering. In fact, flowering will occur at about the same time as if you had waited for pre-flowers to show!

Plants grown from seed under an 18/6 day/night photoperiod will generally show pre-flowers before plants that are given a 24/0 day/night photoperiod. Once pre-flowers are distinguishable as male or female, plants can be induced to flower with a 12/12 day/night photoperiod.

This beautiful male flower has dispersed its yellowish pollen into the air.



Grains of pollen are miniscule. This close-up of a grain of male pollen is magnified 4000 times. Eirik (www.overgrow.com) captured this image on a scanning electron microscope.

A word of caution from bc-trichome-farmer (www.overgrow.com): "Do not try to sex a seedling based on the very first pre-flower. Wait and make sure. The time between using a 25X (loupe) to spot the very first pre-flower and the plant dropping pollen is at least 10+ days away, so it's safe."

Male Flowering

When given a 12/12 day/night photoperiod, male cannabis reaches maturity and flowers one to two weeks before females. However, male plants do not necessarily need a 12/12 day/night photoperiod to dawn flowers and shed pollen. Males can flower under long days and short nights as well, but they generally produce fewer flowers. Once male calyxes show, pollen develops quickly and can disperse within a very short time. There is always an early opener that sheds pollen, often within 24 hours or less! To avoid pollination problems, remove males as soon as they are distinguished. If growing male plants, always isolate them from females, so they will not be pollinated. See Chapter 5, "Harvest," for more information on harvesting males.

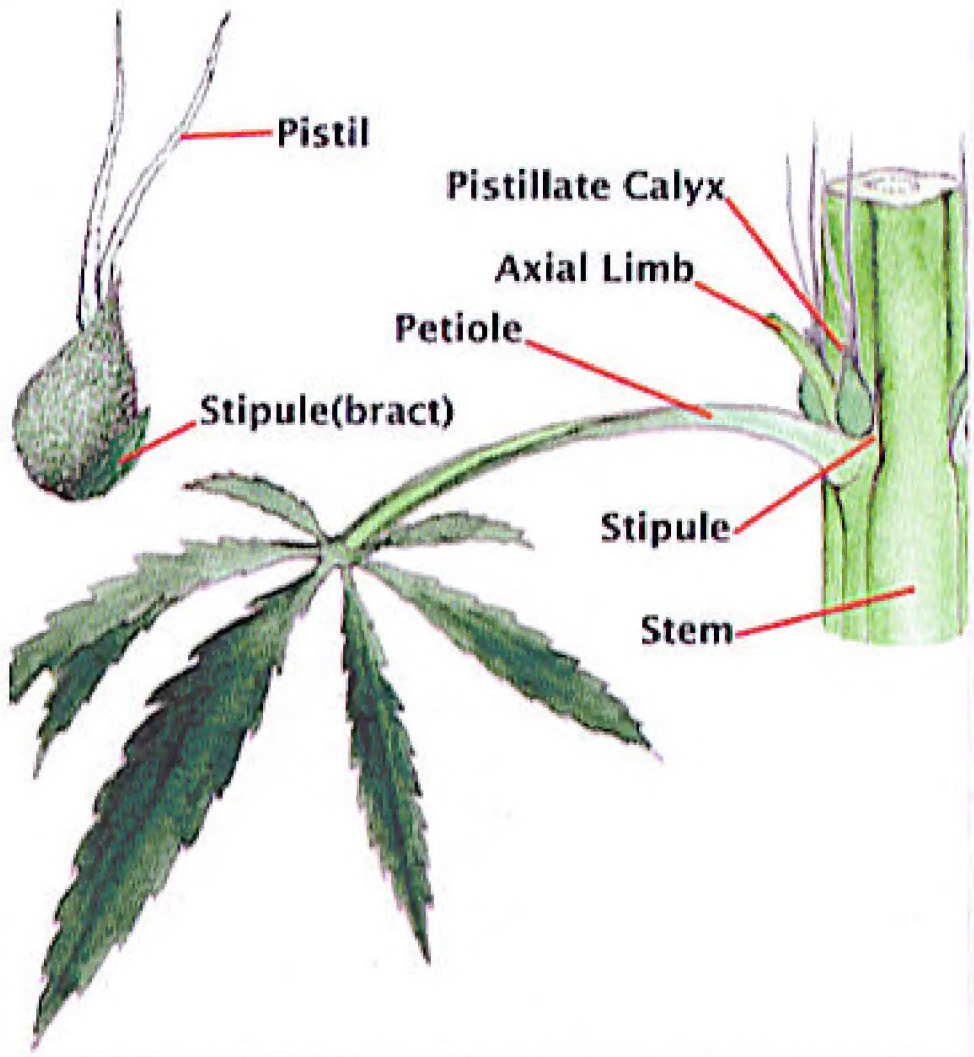
Males continue flowering and shedding yellowish, dust-like pollen from bell-shaped pollen sacks well into the females' flowering stage, which ensures pollination. If you are making seeds, pollinating females too early, before the girls have developed many receptive female pistils, will result in a small seed crop. See Chapter Seventeen, "Breeding," for more information.

Male flowers are about one quarter-inch (6 mm) long and pastel green to yellowish in color. Flowers first develop near the top of the plant. Pollen sacks develop on a short spike and hang in clusters at the base of branches. Gradually, flowers develop towards the bottom of the plant. After two to six weeks of the 12-hour photoperiod, fully formed floral sacks split open and shed pollen.

Males are usually taller than females and have stout stems, sporadic branching, and fewer leaves. In nature, wind and gravity carry pollen from taller males to fertilize (pollinate) receptive females. Male plants produce fewer flowers than females, because one male plant can pollinate many females. Males also contain less THC and overall lower cannabinoid levels.

Males fertilize females, causing them to stop high THC production and start seed formation. Remove and destroy males, except those used for breeding, as soon as their sex has been determined. The instant they show sex, separate male plants used for breeding from females. Do not let them shed pollen. Premature pollen sacks often form and open early or are hidden under foliage and go unnoticed until it is too late. If growing from seed, take special care to ferret out male flowers and plants.

Growers have reported that bouncing the photoperiod around and dynamically raising or lowering the temperature have the effect of producing more male plants. Note that each stimulus involves creating a climate that



This drawing shows the main parts of a female cannabis plant.

The green calyx supports two very small pistils on this pre-flowering 'Flo' from DJ Short.

The pre-flower on this 'Mr. Bubble' female is very easy to spot with the naked eye.

Pre-flowers on this 'Puna Budder' from THSeeds are nearing the end of the pre-flowering stage that lasts about two weeks.

causes plants to suffer stress. Also, the stressful environment does not necessarily turn the entire plant male; it turns it hermaphrodite. The most susceptible plants already have a predisposition to hermaphrodism. See Chapter Sixteen, "Breeding," for more information.

There are several ways to promote male or female plants during seedling growth. (See "Grow More Female Plants from Seed" in Chapter Two). During vegetative growth you can get a good idea of a plant's sex from its genetic background and growth characteristics. The most dependable way to deduce sex is "Cloning for Sex" (see Chapter Three). For a complete discussion, see Chapter Sixteen, "Breeding."

Female

Female and Sinsemilla

Female Pre-flowering

Near the end of normal vegetative growth, plants grown from seed develop pre-flowers. This is when female calyx formation initiates, and it is not contingent upon photoperiod. It occurs when a plant is old enough to show signs of sexual maturity, about the fourth week of vegetative growth, or six to eight weeks from germination. The pre-flowers emerge behind the stipule at the fourth to fifth branch internodes.

A pre-flower looks like a regular female flower; most have a pair of white fuzzy pistils. Pistils normally form after the light green seed bract part of the pre-flower has formed. Wait until pistils have formed to ensure the plant is a female and not a male. The pre-flowering stage lasts from one to two weeks. A little patience is in order now!

Plants grown from seed under an 18/6 day/night photoperiod will usually show pronounced pre-flowers before plants given a 24/0 day/night photoperiod. And, under a 16/8 day/night regimen pre-flowers show more quickly and are often more

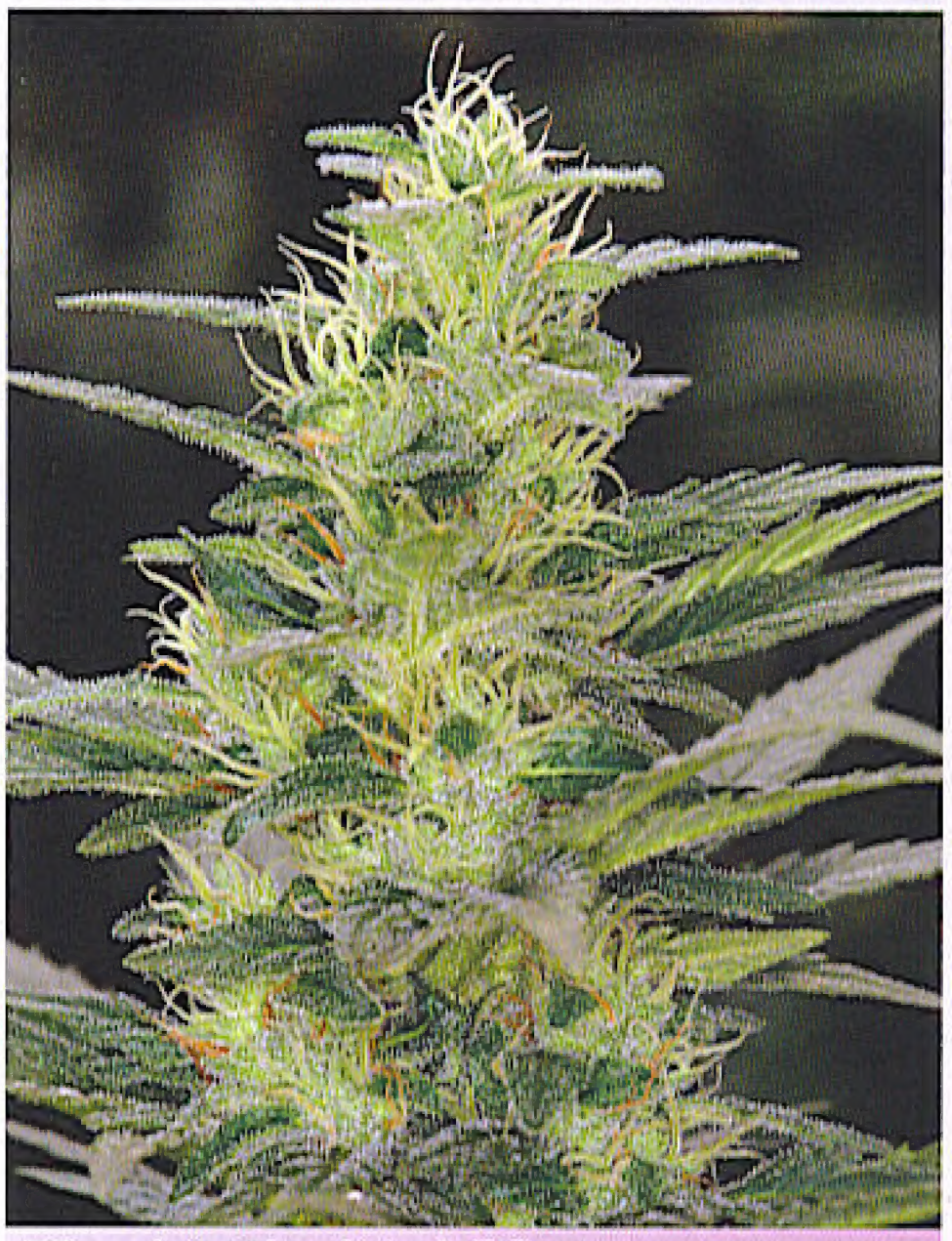
pronounced. Once pre-flowers are distinguishable as male or female, plants can be induced to flower with a 12/12 day/night photoperiod.

Always wait to induce flowering until after pre-flowers appear. Inducing flowering with 12 hours of uninterrupted darkness and 12 hours of light before pre-flowers develop will stress the plant. This stress could cause odd growth, and plants might grow into hermaphrodites. Inducing flowering before pre-flowers form will not speed flowering. Flowering will occur about the same time as if you had waited for pre-flowers to show!

Female Flowering

Female cannabis is prized for heavy, potent resin production and weighty flower yield. Ideal female plants grow squat and bushy with branches close together on the stem and dense foliage on branches. In most strains, the first signs of female flowers appear one to three weeks after inducing flowering with the 12-hour photoperiod. Female flowers initially appear near the top of the terminal bud and gradually develop on lower branches starting at the tips and moving downward. Flowers have two small one-quarter to one-half inch (6-12 mm) fuzzy, white hairs, called pistils that form a "V." The set of pistils is attached at the base to an ovule, which is contained in a light green pod, called a calyx. Pistil-packed calyxes form dense clusters or buds along stems. A cluster of buds is often called a top or cola. The masses of calyxes develop rapidly for the first four or five weeks, after which they grow at a slower rate. Buds put on much of their harvest weight as they swell during the last two or three weeks of growth. Pure sativas, including Thai varieties, can flower for four months or longer! Once the ovule has been fertilized by male pollen, rapid calyx formation and resin production slow, and seed growth starts.

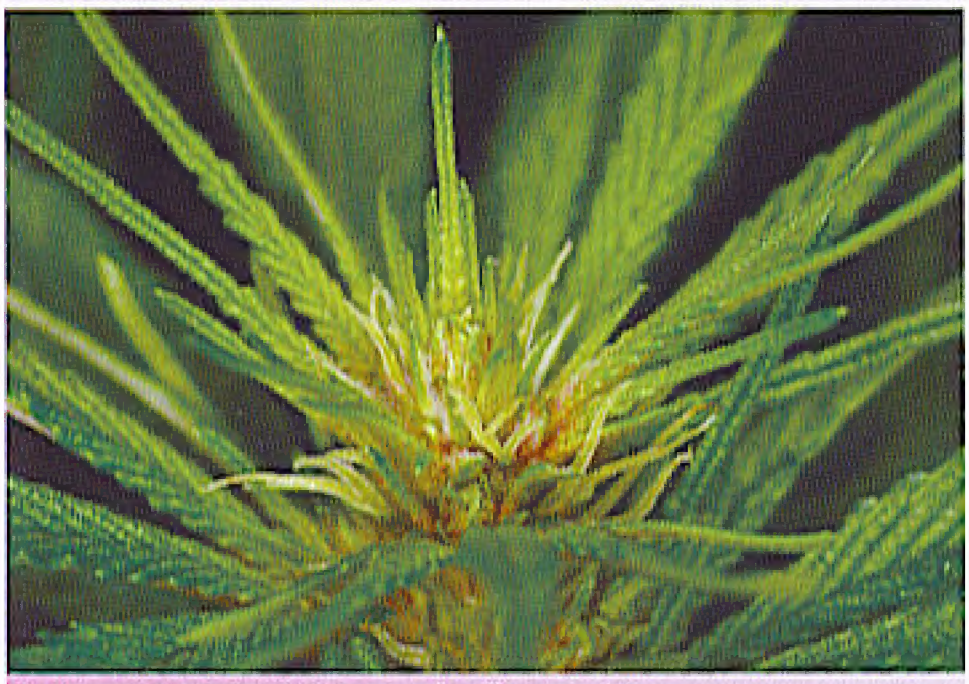
'Chocolate Chunk' in early flowering



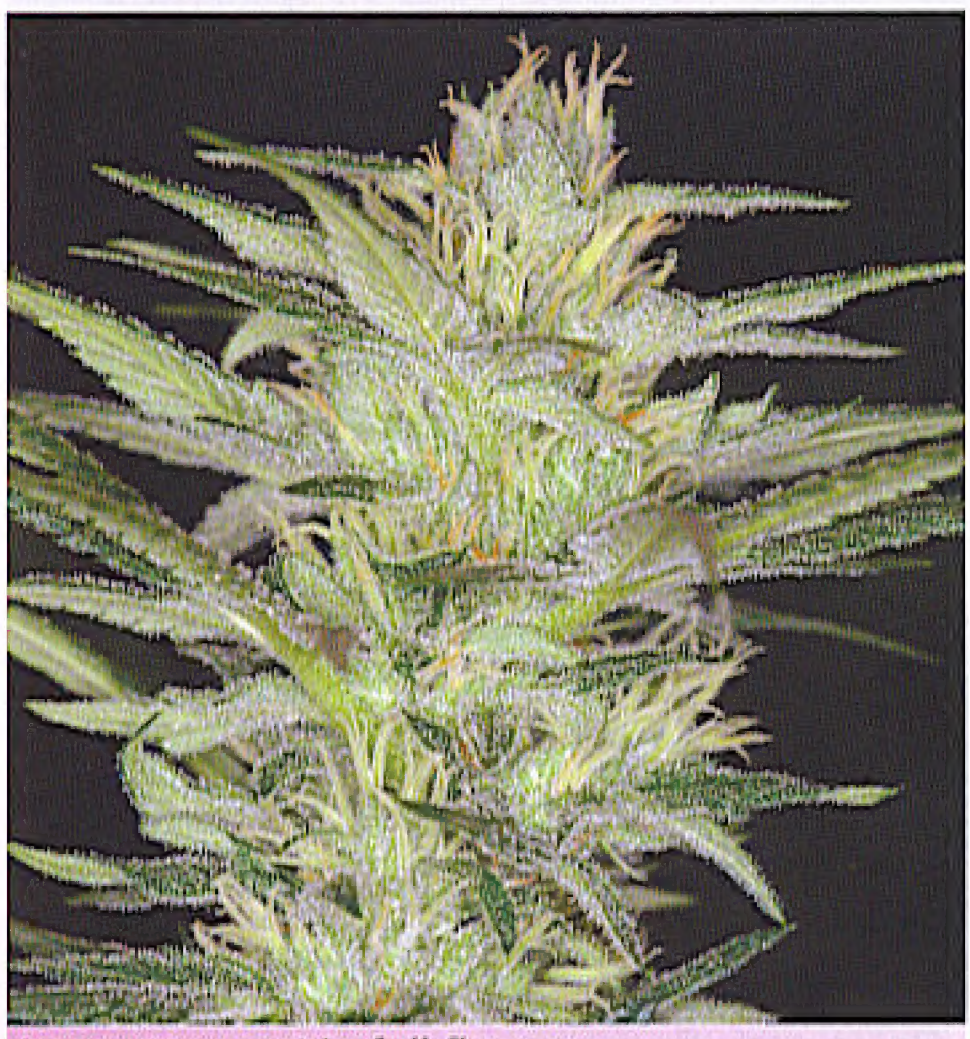
'Chocolate Chunk' in full flower

'Flo' in early flowering

'Flo' in full flower



'Haze Heaven' in early flowering



'Haze Heaven' in full flower

When females' flowering is at their zenith, pistils swell and swell. Soon they change in color, most often from white to amber and, eventually, to reddish brown.

Sinsemilla

Sinsemilla (pronounced sin-semiya) is derived from two Spanish words: "sin" = without and "semilla" = seed. Sinsemilla is the word that describes flowering female cannabis tops that have not been fertilized by male pollen.

Highly prized sinsemilla buds are the most potent part of any strain, with a proportionately large volume of THC per flower bud,

'Mr. Bubble' in early flowering

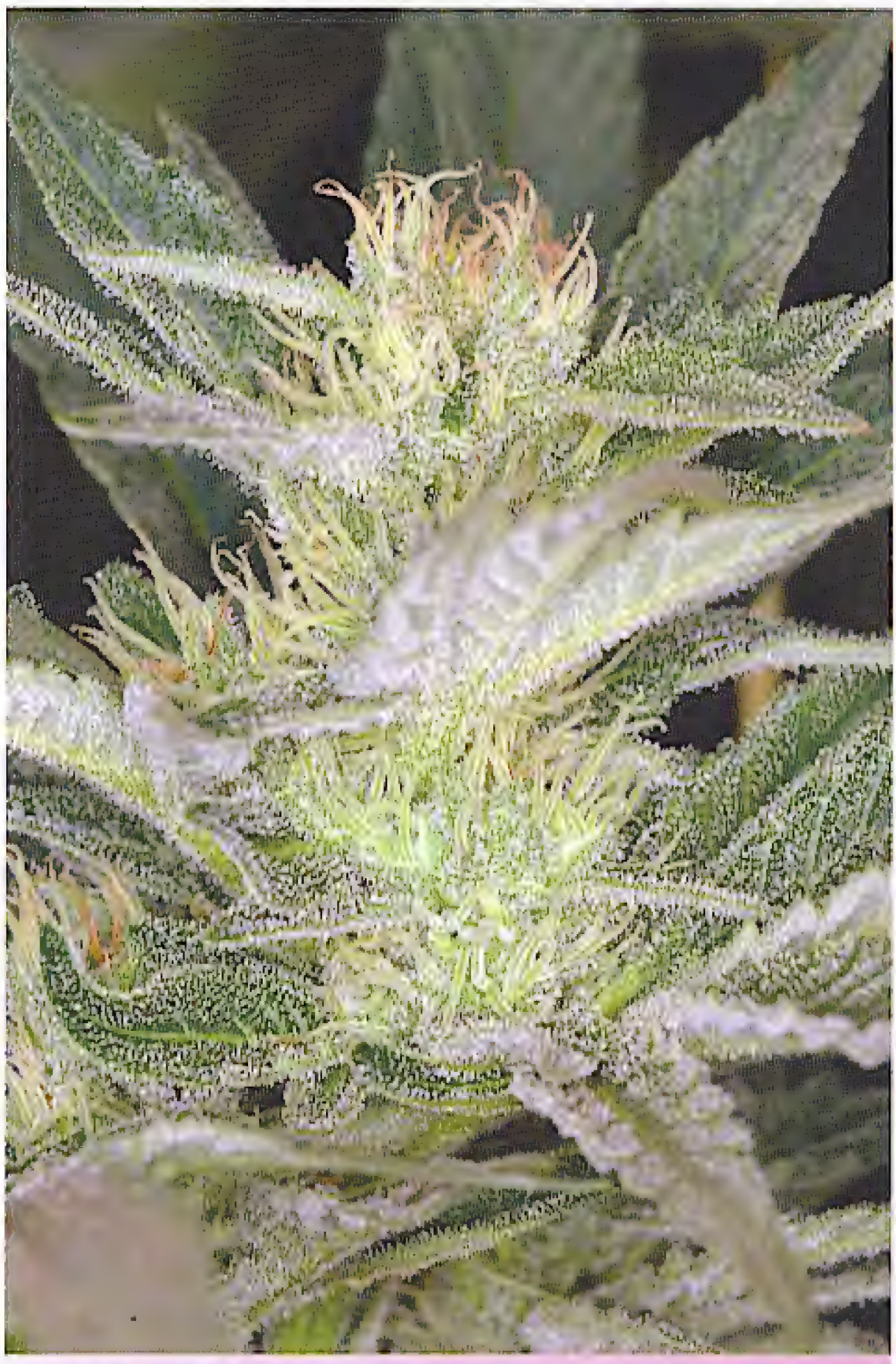
'Nebula' in early flowering

'Stinky Pinky' in early flowering

'Shaman' in early flowering

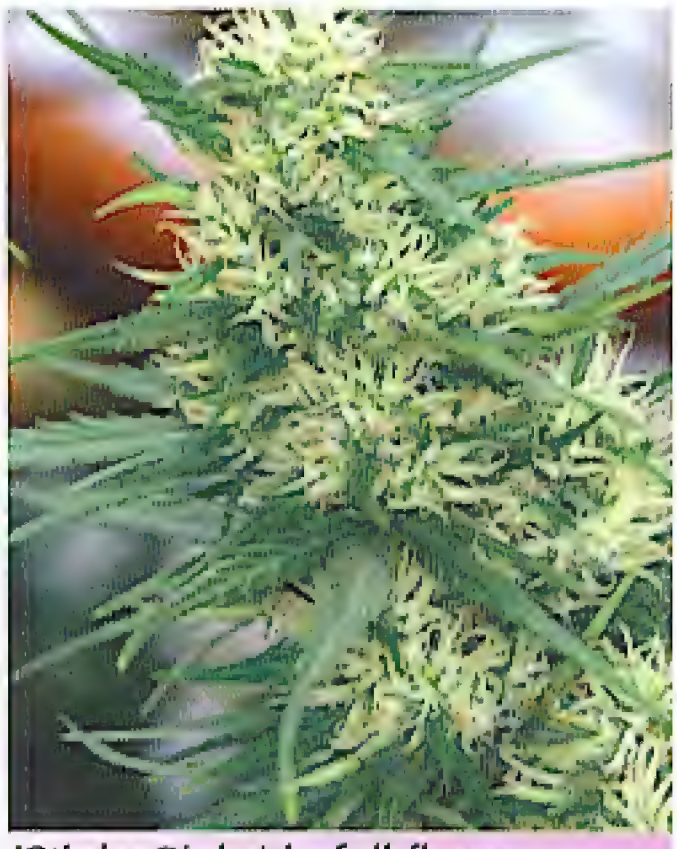
and it's all smoke, no seeds! Unpollinated female plants continue to flower until calyx formation and resin production peak out, six to ten weeks after turning the lights to 12 hours. During six to ten weeks of flowering, calyxes develop and swell along the stem, yielding more high quality buds than pollinated, seeded flowers.

Make any female marijuana sinsemilla by removing male plants as soon as they are identified. Removing males virtually guarantees that male pollen will not fertilize succulent female pistils. Sometimes a few early grains of pollen are shed by premature male flowers. Pollen dispersed from wild or cultivated male cannabis plants could also be floating in the air. Sometimes a hermaphrodite with a few male flowers will sprout on a predominately female plant. See "Hermaphrodites" in Chapter Sixteen, *Breeding*.

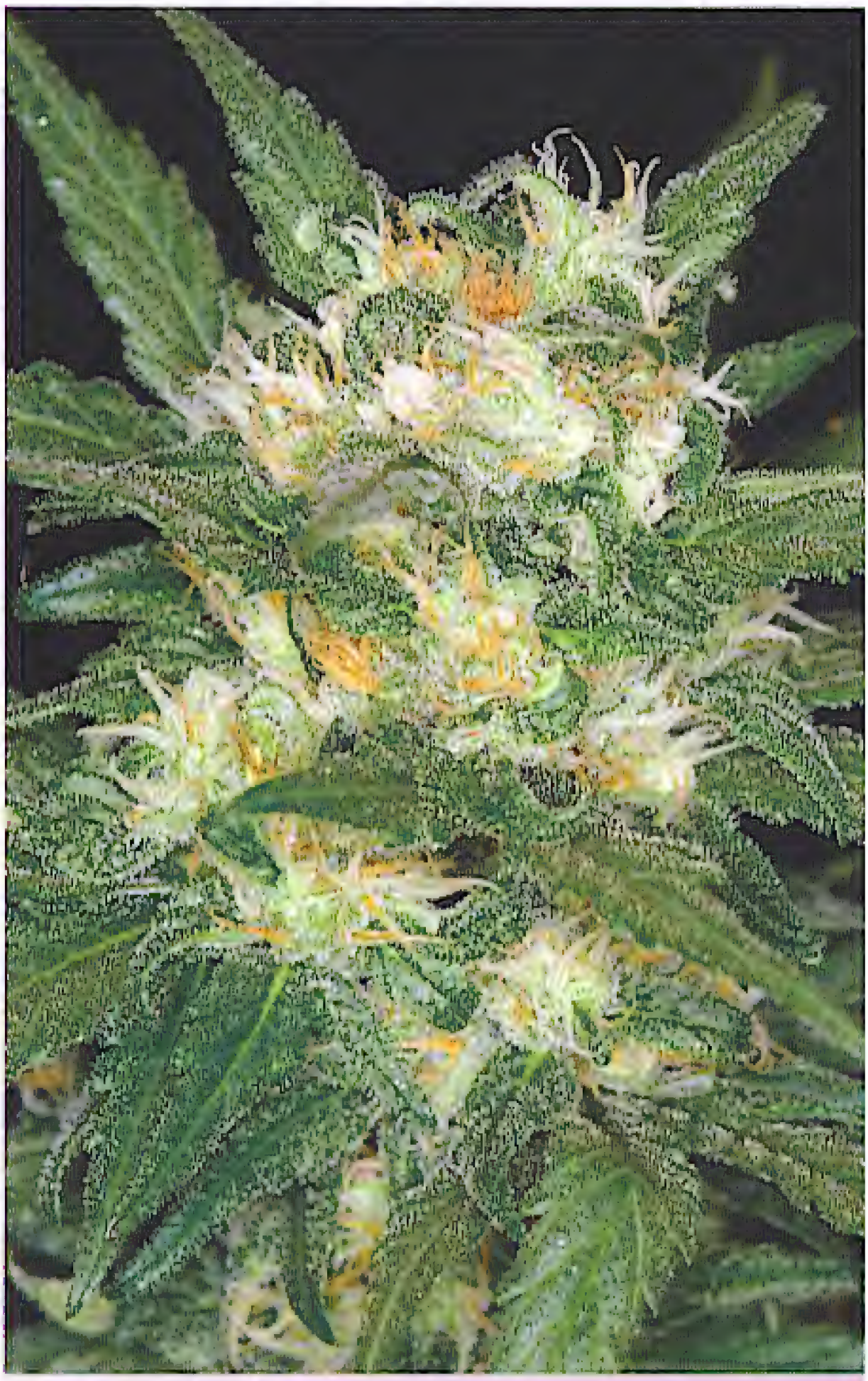


'Nebula' in full flower

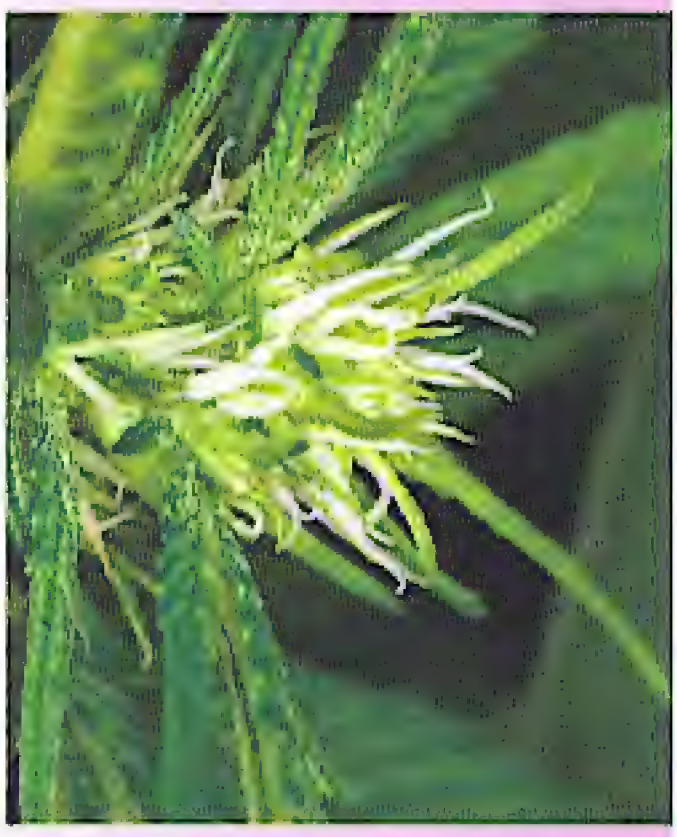
'Warlock Passion' in early flowering



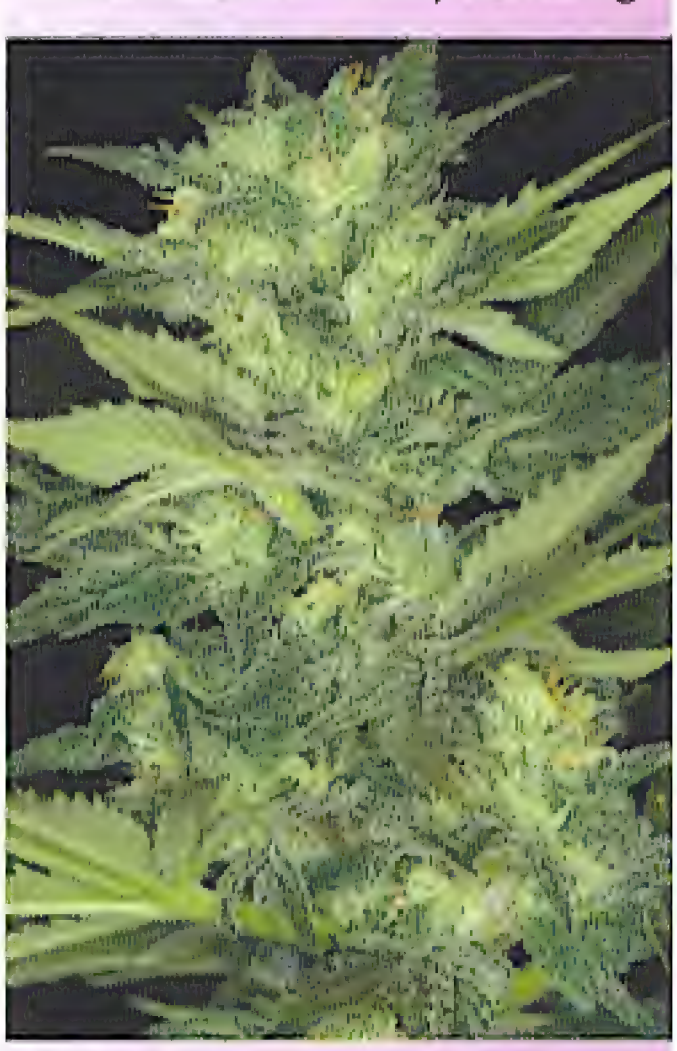
'Stinky Pinky' in full flower



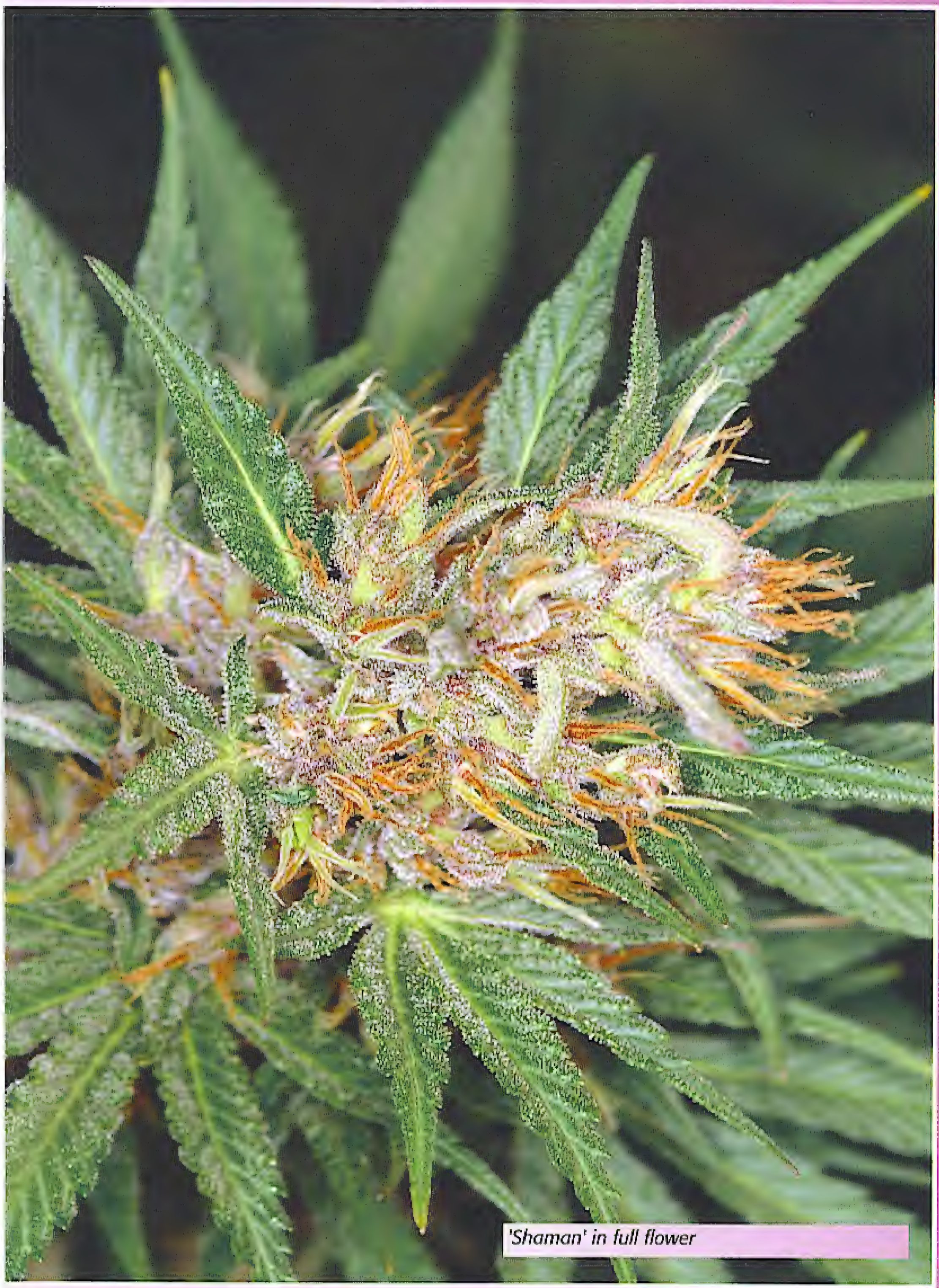
'Warlock' in full flower



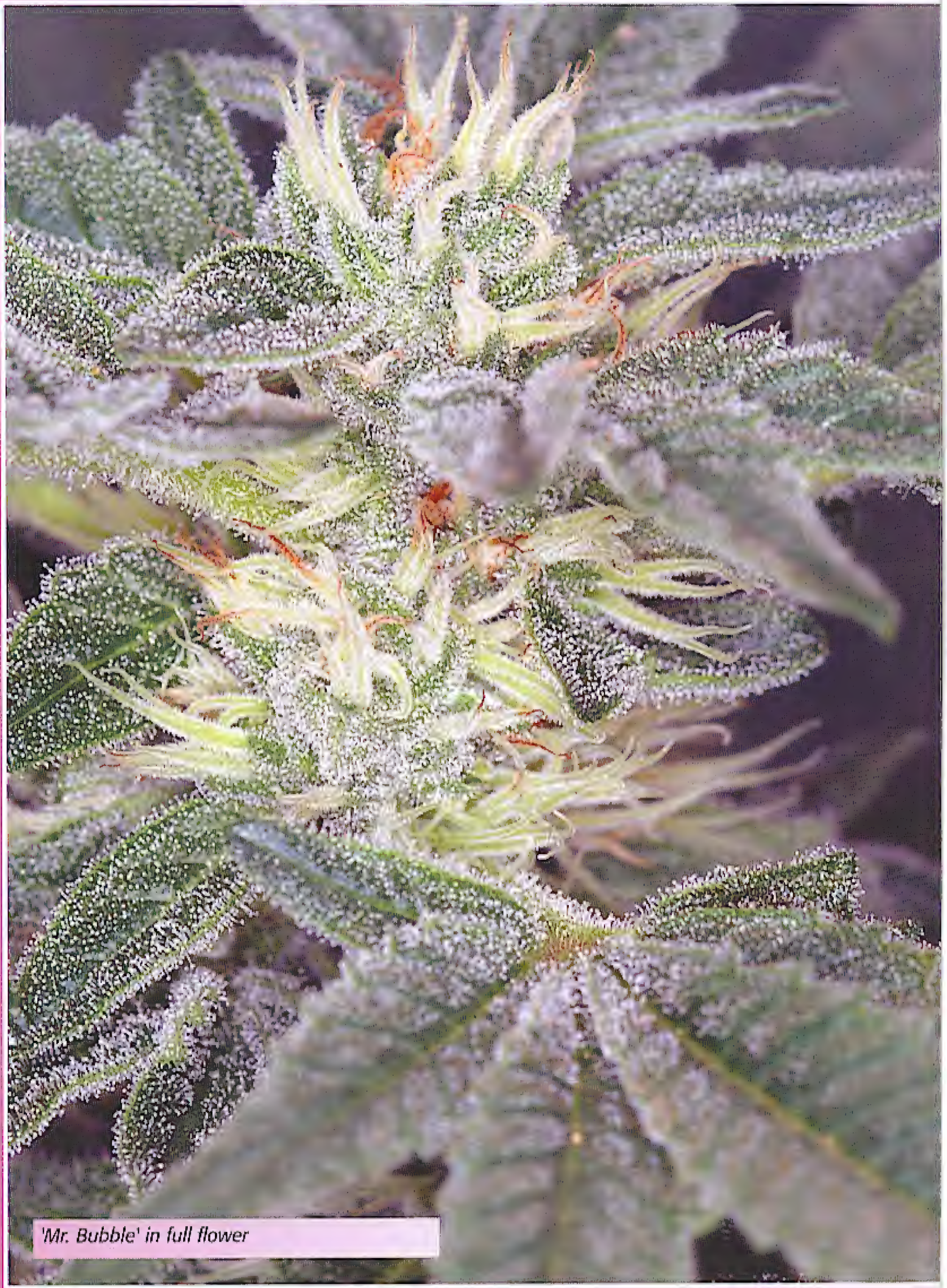
'White Russian' in early flowering



'White Russian' in full flower



'Shaman' in full flower



'Mr. Bubble' in full flower

Spanish grower wrapped newspaper around plants to protect them from light.

This outdoor crop is hanging in the entrance to a barn. A breeze flowing through the opening carries away evaporated moisture and fragrance.

This chest of drawers has screens on the bottom. Place buds on screens to dry.

hot car dashboards and away from heat vents, etc. Friction and rough handling bruise and knock off resin glands. Even with proper drying and curing, brutal handling of harvested marijuana will diminish THC content. Baggies and fondling hands rupture millions of tiny resin glands in the world every minute! To keep dried marijuana in mint condition, store it in a dark, airtight, glass container, and place it in the refrigerator. Ordinary canning jars allow buds to be admired as well as protected. Glass containers do not impart any plastic or metal odors and contain the pungent fragrance of fresh marijuana buds. Placing an orange or lemon peel in the jar will add a citrus aroma to the bouquet.

Curing

Curing allows buds to continue to dry slowly. The first week of curing affects potency in that it evenly removes moisture within the bud so virtually all the THC is psychoactive. Curing also allows buds to dry enough that mold does not grow when buds are stored. Well-cured buds have an even glow when burned and smoke smooth.

After plants, branches, and/or buds have dried on screens or hung in a drying room for five to seven days and appear to be dry, they still contain moisture inside. This moisture affects taste and potency. Curing will remove this excess moisture. Curing makes the bud uniformly dry and converts virtually all THC into its psychoactive form.

Cut stems into manageable lengths–less than 12-18 inches (30-45 cm)–and place them in an airtight container. Airtight glass containers with a rubber or similar seal are the best. Avoid Ziploc and other plastic bags that are not airtight. Plastic bags used for long-term storage are airtight. The "reflection anti-detection barrier foil bags" available from Hy Supply (www.hysupply.nl) are airtight and infrared-proof. Some growers avoid plastic containers such as Rubbermaid™ bins and Tupperware™, saying the plastic imparts an undesirable flavor to the

buds. But when curing large amounts, such plastic bins are the best option because stuffing 10 pounds (4.5 kg) or more into small canning jars would be laborious and impractical.

Enclose buds in a container to create a microclimate that allows moisture to even out within the buds. Internal moisture will migrate to the dry portions of the bud. Gently pack as many buds into container as possible without forcing and damaging them. Leave the containers in a cool, dry, dark place. Check in two to four hours to see if buds have "sweated" moisture. Check buds by gently squeezing to feel if they are moister than they were a few hours before. Be careful when squeezing buds; resin glands bruise easily.

If stems fold instead of snapping when bent, and buds are still moist to the touch, remove them from the container and gently place in the bottom of a paper bag. They can be stacked in the paper bag as high as six inches (15 cm). Fold the top of the bag once or twice to close. Check the buds two to three times during the day to monitor drying. Carefully turn them in the bag so that different sides are exposed. Remove when they are dry and place back into the sealed container. Check them the next day to see if they are evenly dry. Stems should snap when bent. If too moist, put them back in the paper bag until dry. When dry, return to the curing container.

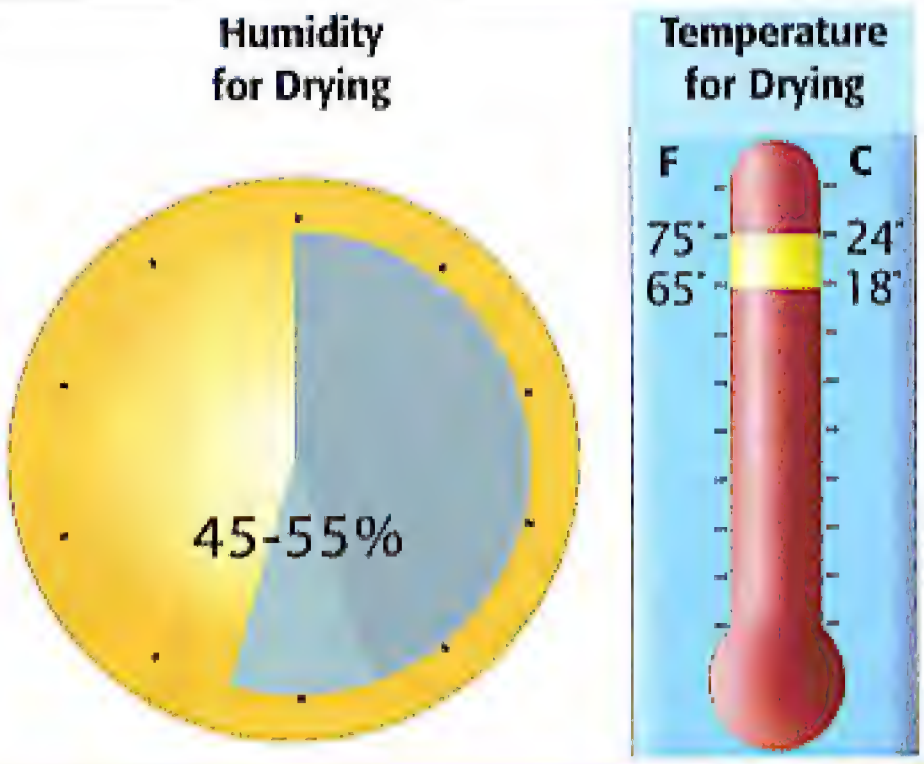
If buds appear to have fairly low moisture content, and stems snap when bent, leave them in the container and let excess moisture escape out the top. Open the container for a few minutes every few hours to let the excess moisture escape before closing the lid again. At this point you can add an orange or lemon peel to the container to impart a slight citrus aroma.

Check the container several times daily. Leave the top off for five to ten minutes so moisture evacuates. Depending upon moisture content, buds should be totally dry in a few days to two weeks. Once they are evenly dry, they are ready to seal in an airtight container for storage.

Lay small buds in a box to dry. Turn them daily to promote even drying and prevent mold.

Exact conditions that are best for drying

1.	Temperature	65–75°F (18-24°C)
2.	Humidity	45–55 percent
3.	Light	None
4.	Handling	Minimum
5.	Leaves	Remove at harvest
6.	Manicured buds	Hang until dry



Humidity and temperature that are best for drying.

Fast Drying

Here are six ways to dry buds quickly. Remember, buds that dry quickly burn hot; the smoke is harsh, and they taste "green" when smoked.

One: Manicure fresh buds and remove all branches. Spread them out evenly and wrap in paper or enclose in an envelope. Place the paper or envelope on a warm refrigerator, radiator, television, etc. Depending upon heat level, buds will be dry in a few hours to overnight. Buds will be a bit crispy when dry. Place buds in an airtight container until they sweat. Put back in the paper and dry until dehydrated enough to burn well.

Two: Cut up fresh buds and/or foliage. Place on a 12-inch (30 cm) square of tinfoil. Hold or place it over a 60-100-watt light bulb. Stir every 15-30 seconds. It will be dry enough to smoke in one to three minutes.

Three: Place diced buds and/or foliage on a cookie sheet in an oven at 150°F (65°C) for 10-15 minutes. Check regularly and stir if needed until dry. Do not increase temperature above 200°F (93°C) or the THC will vaporize into the air.

Four: Place cut up buds and/or foliage in a microwave oven. Turn the microwave on in short, weak (50 percent power) bursts of 15-30 seconds each. Recycle until dry, and stir if necessary.

Five: Cut buds and/or foliage into small pieces, and place in a glass jar with an airtight lid. Place several silica gel desiccant packs (the kind that come with electronic devices and cameras) into the glass jar and seal. Moisture will migrate to the silica gel in a few hours. Remove the packets and dry using dry heat source. Replace silica packs until marijuana is dry enough to smoke. Find silica gel packs at auto parts or electronics stores.

Six: Drying buds in a food dehydrator for 24-48 hours is the next best option. Food dehydrators are a series of stackable screens. Place bud and leaf on screens and stack. A fan blows air gently upward to dry the marijuana quickly. One friend used this technique and the buds smoked OK, but it was the only dope around, and this could have colored my taste perceptions!

Freeze Drying

Dry ice is frozen carbon dioxide. When it warms, CO_2 converts from a frozen solid to a gas, without turning into a liquid. When moist marijuana is enclosed with dry ice (frozen CO_2) at virtually zero relative humidity, water molecules migrate from the cannabis to the dry ice. This causes the relative humidity of the CO_2 to increase and the moisture content of the marijuana to decrease. This process occurs below 32°F (0°C), and it preserves cannabis.

Place equal amounts of dry ice and bud into a container. Put the dry ice on the bottom and bud on top. Seal with a lid. Make a few small holes in the lid of the container for excess gas to exit. Place in your kitchen freezer. Check every 12-24 hours. When the dry ice is gone, the buds should be completely dry. If not dry, add more dry ice until cannabis is dry. Conserve dry ice by partially drying buds for a few days before enclosing with dry ice.

This method retains potency and freshness and causes very little degradation of resin glands from heat, light, air, and fondling hands. The smoke has a mint-like taste because the chlorophyll does not break down.

To find the approximate moisture content of dry buds, weigh a specific bud upon harvest when it is wet. Weigh it again during the drying and curing process to learn how much moisture it has lost. For example, a bud that weighs 10 grams (0.36 oz) upon harvest, will weigh 2.5 grams (0.09 oz) when it has lost 75 percent of its moisture. In general, a dry bud will weigh 75 percent less than its wet weight at harvest.

This grower lets buds dry slowly in a large cedar box before moving them to a glass container for the final cure.

Packaging and Storage

Storing cannabis in an airtight environment will preserve aroma, taste, and potency. Use a vacuum sealer to evacuate air in glass jars. Inexpensive vacuum sealers are available in the canning section of grocery and variety stores. Growers report that containers sealed with inexpensive vacuum sealers lose the vacuum after a few days. More expensive vacuum sealers such as the one available at www.deni.com work much better. When properly vacuum-packed, buds will stay as fresh the day they were sealed in the airtight jar.

Vacuum seal the jar, and place it in the refrigerator for storage. Leave it in the refrigerator or a cool, dark, dry place for a month or longer. The taste and potency will be tops! Refrigeration slows decomposition, but, remember, refrigerators have a high humidity level, so the container must be sealed airtight. I just checked the relative humidity and temperature in my refrigerator–65 percent relative humidity and 5°C (40°F). Do not place it in the freezer. Freezing draws moisture to the surface of buds, which can harm resin glands on the surface.

Place sealed containers in a cool, dry, dark place. Some growers prefer to keep airtight, sealed containers in the refrigerator. If the seal is not airtight, the low temperature in the refrigerator creates a condition of high humidity. Dry buds stored in a container that is not airtight attract moisture in the high-humidity environment. Before long, the buds are so moist that they must be dried again.

Remove the lid of a jar two or three times a day to allow moisture to escape during the curing process.

Curing jars with a rubber seal keep the environment inside airtight.

Buds are bagged after weighing.

Bagged buds are then put into the vacuum/sealing machine.

Once in place, air is removed and the bag of buds is hermetically sealed.

The end result is a compact, airtight bag of buds.

Seed Crops

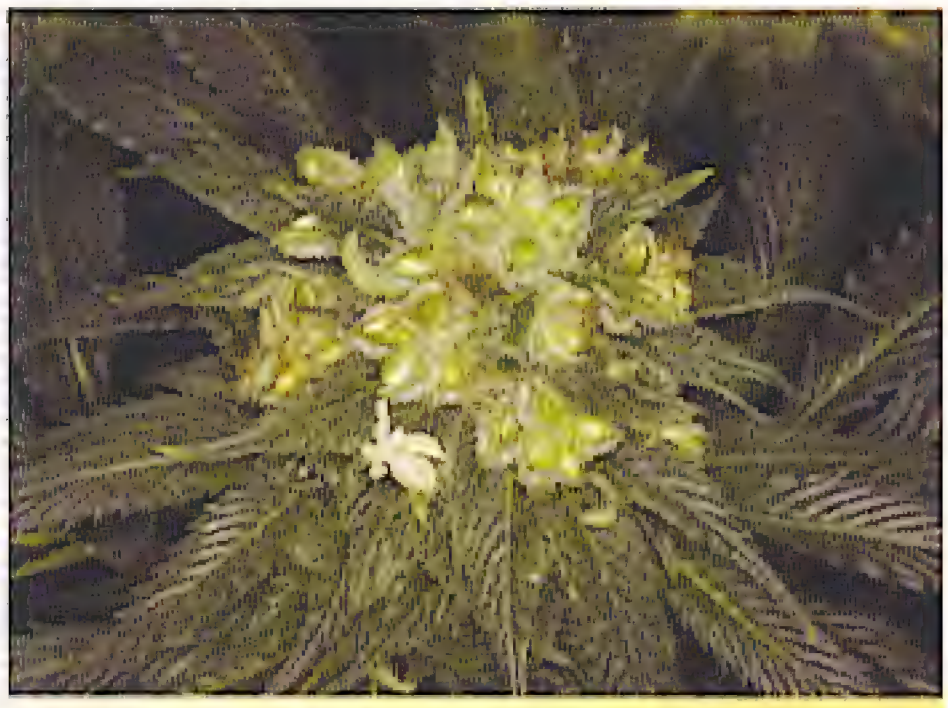
Harvest seed crops when seeds are big and ripe. Often, seeds actually split open their containing seed bract. Flowering females grow many ready, receptive calyxes until pollination occurs. Seeds are fully mature within six to eight weeks. Once pollinated, the majority of the female's energy is directed toward seed production. Tetrahydrocannabinol (THC) content is usually of minimum importance. Seed crops can be left in the ground until seeds "rattle in the pod," but most growers harvest them before then. Watch for and control insects, mites, and fungus that attack the weakening female and her cache of ripe seeds.

Home breeders often pollinate only one or two branches. The unpollinated branches are sinsemilla. The sinsemilla tops are harvested when ripe. Seeded branches continue to mature for another week or two until ripe. When seeds are mature, remove them from the pods by rubbing seeded buds between your hands over a container. To separate seeds from marijuana, place harvested seeds and accompanying

Seeds in this 'Blueberry' female from Dutch Passion are split open, resin-coated calyxes.

foliage in a large tray with sides. Move the tray back and forth and tip so the seeds congregate in one corner. Remove excess marijuana by hand and repeat the process. Rub seeds together in your hands to remove traces of calyxes that still adhere to seeds. Agitate tray and tip to congregate seeds and separate from chaff.

Store seeds in a cool, dry, dark place. The seeds are viable and ready for planting as soon as they are harvested, but they may grow sickly plants. Let the seeds dry out a month or two before planting. Seeds with a hard outer cask are the most likely to sprout and grow well. See "Storing Seeds" in Chapter Two.



This photo of a seeded 'TNT' female was snapped in Gypsy Nirvana's grow room before the police harvested her.

Rejuvenation

Rejuvenate harvested females by leaving several undeveloped lower branches with foliage on plants. Give her an 18/6 day/night photoperiod. The female will stop flowering and rejuvenate and revert back to vegetative growth stage.

Give the harvested, leafy, buddy stubs an increased dose of high-nitrogen fertilizer to promote green, leafy growth. This will help the harvested plant grow more foliage as it reverts back to vegetative growth in four to six weeks. New, green, leafy growth will sprout from the branches and flower tops. Leaves will continue to grow more and more "fingers" as re-vegetation progresses. Let the rejuvenated plants grow until they

Let seeds develop until they are big and strong. Most often some of the seeds will actually split open the containing calyx.

are the desired size before inducing flowering with a 12-hour photoperiod. If second crops are allowed to grow too tall, they produce sparse buds. Remember, these plants are already root bound and when given dim light, sparse buds result.

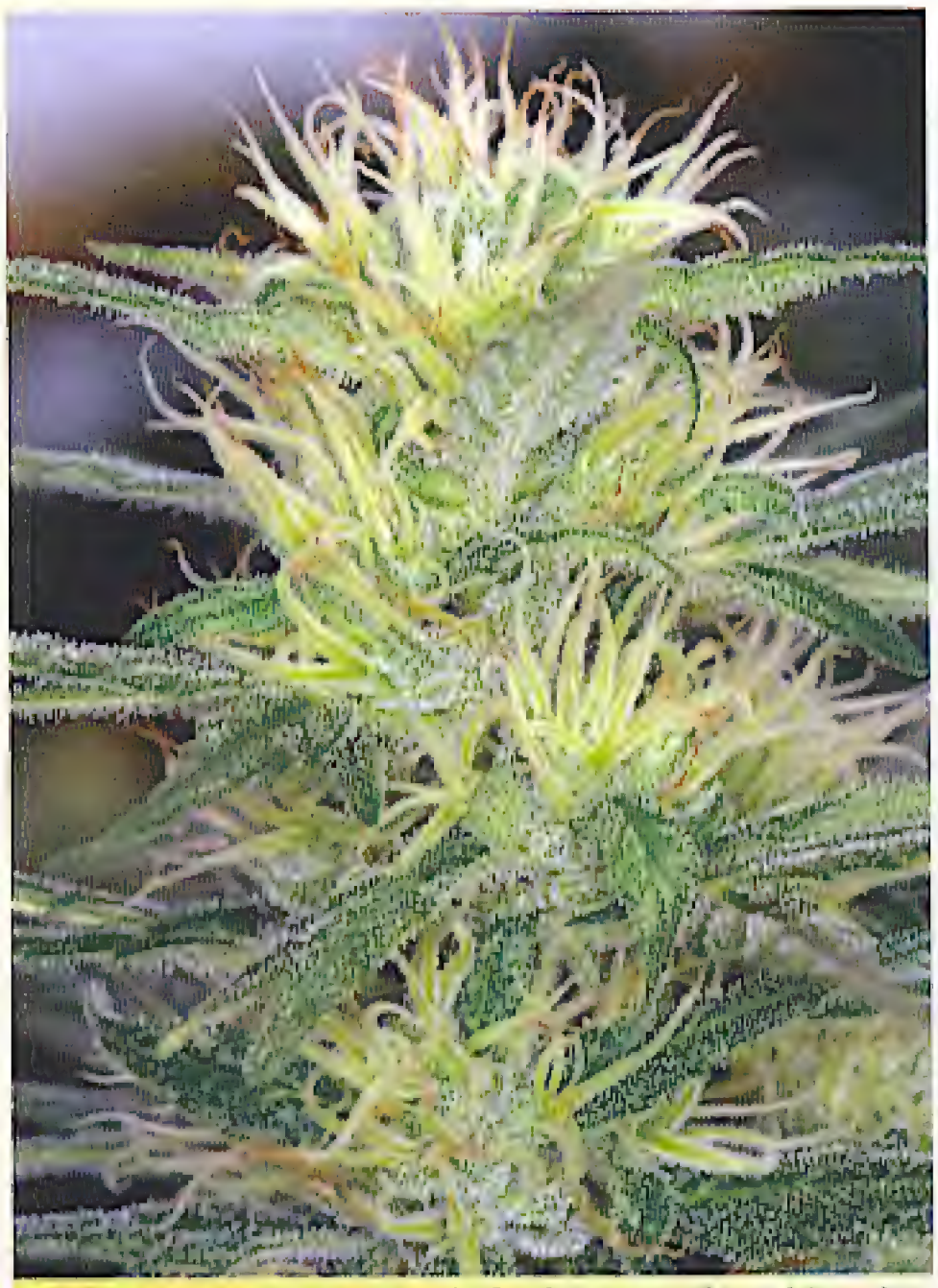
Here is a possible scenario to rejuvenate plants. For example, a person who grew a beautiful crop of females and knew each plant by name, had to harvest. Instead of starting from seed again, the grower decided to leave a few leaves and buds on the harvested stubby branches. He induced vegetative growth with 18-hour days and 6-hour nights the day after harvesting. A month later, he took many clones from these original favorite females. He induced the original mothers to flower a month after the clones were taken. The clones were rooted, transplanted, and moved into a flowering room. The original harvest was taken on January 1st. The second harvest was April 1st. The second harvest weighed less, and the buds were smaller. Taking clones from rejuvenated plants also diffuses hormones and severely stresses plants.

Rejuvenated plants take from a month to six weeks to develop new vegetative growth.

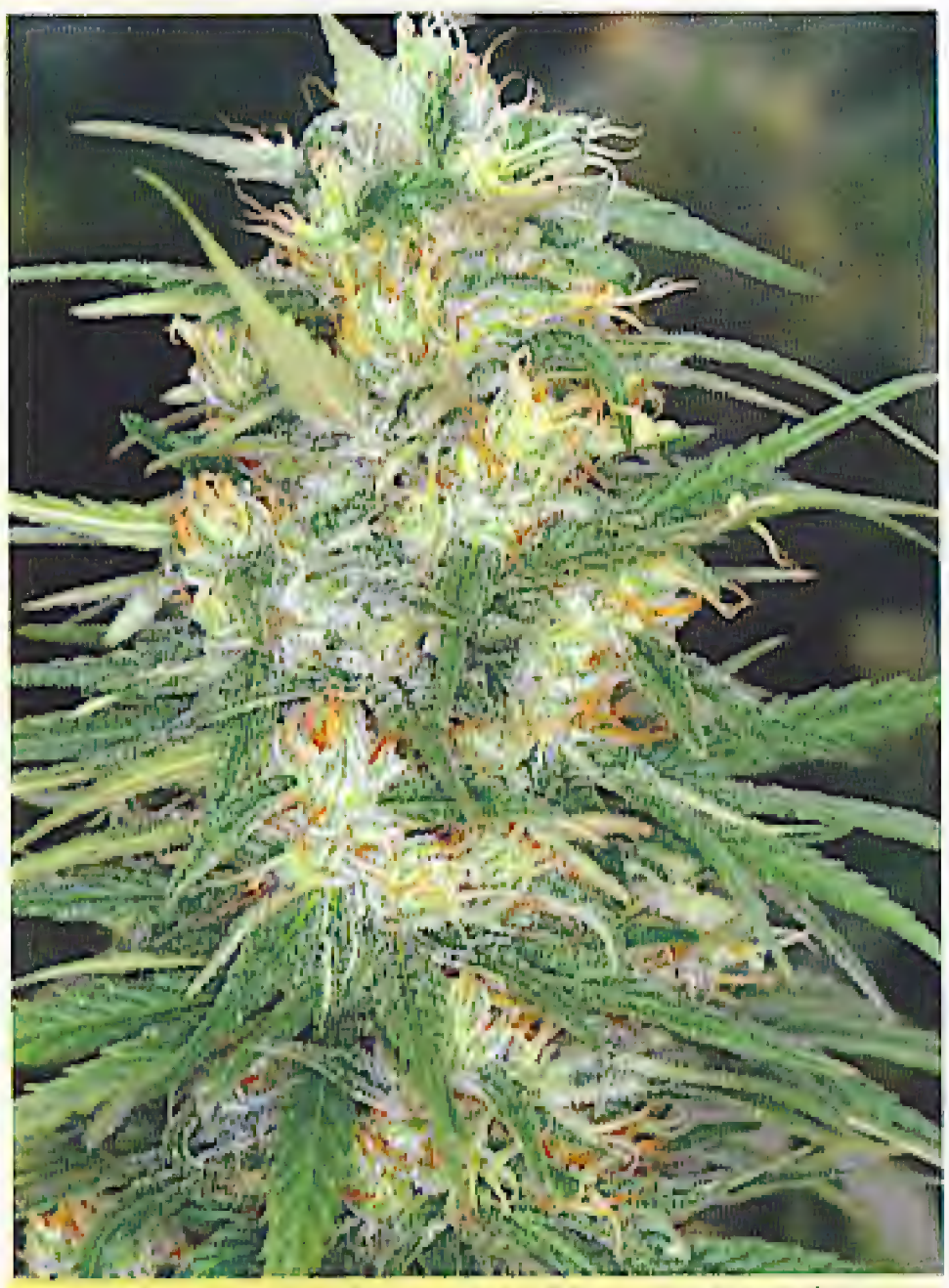
This female received 18 hours of light daily. A mistake made it receive a 12/12 day/night schedule for three days, which induced flowering. The grower put it back on an 18/6 day/night photoperiod. The plant took 6 weeks to resume normal vegetative growth. The light stress also caused leaves to grow in circles!

Chapter FIVE
HARVEST

Inspect resin crystals with a 30X microscope to discern the exact time to harvest.



This 'Thaitanic' is not ready for harvest. The white pistils are just starting to turn color.



This 'Thaitanic' is at the point of harvest. Note that many of the pistils are turning color.

Introduction

The payoff for all the research, work, risk, expense, and the long, patient wait is a bountiful harvest. Strong, healthy, well-grown clones and seedlings yield the heaviest harvests. A well-organized pre-harvest and harvest are essential to preserve cannabis quality and decrease the workload.

Harvest when plants are at peak ripeness. Depending upon the high you like, which is discussed below, harvest timing is critical. The peak harvest window is open for about five to seven days.

Once harvested, most growers manicure buds before drying them slowly and evenly so THC is preserved. After drying, buds should cure to achieve full aroma and flavor. Like a fine wine, aging or curing improves taste and fragrance. Once cured, proper storage will ensure buds retain all of their essential qualities.

Before Harvest

Fragrance is often a problem before, during, and after harvest. Control fragrance by keeping drying and manicuring rooms well-vented. If possible, allow plenty of fresh circulating air to pass through the drying room to remove odors quickly. If air in and around drying and manicuring room is stagnant, odors linger and accumulate. Keep temperatures below 70°F (21°C) so essential oils in cannabis do not volatize and release pleasant but unwanted fragrances. Contain cannabis fragrance in sealed drying and manicuring rooms. Filter air before expelling with a carbon filter. See "Odor" in Chapter Thirteen for more information on controlling fragrance.

Avoid the taste of organic or chemical fertilizers in harvested buds by flushing with plain water or a clearing solution to remove any residuals and chemicals that have built up in soil or plant foliage. Ten to fourteen days before harvesting, flush the garden with distilled water or water treated with reverse osmosis. Use a clearing solution such as Final Flush® if you have to

use plain tap water that contains dissolved solids. Some growers fertilize until three to four days before harvest and use a clearing solution to remove fertilizer residues. Apply this water just as you would apply nutrient solution. Always let at least ten percent, preferably more, drain out the bottom of containers. If using a recirculating hydroponic system, change the water after the first four to six days of application. Continue to top off the reservoir with "clean" water.

How to tell when fertilizer will affect taste.

1. Leaf tips and fringes are burned.
2. Leaves are brittle at harvest.
3. Buds crackle when burning.
4. Buds smell like chemicals.
5. Buds taste like fertilizer.

Do not water for one or two days before harvest. The soil should be fairly dry, but not dry enough that plants wilt. This will speed drying time by a day or more and not affect the quality of the end product.

Harvest

Growth stops at harvest and the THC content cannot increase. It will stay the same or decrease after harvest. Proper handling is the key to retaining THC potency. Prolonged periods of light, temperatures above 80°F (27°C), friction from fondling hands, and damp, humid conditions should be avoided because they all degrade the THC.

The THC chemical is produced in leaves, flowers, and stalked glandular trichomes, lovingly referred to as "resin glands" or simply "trichomes." Stems and roots may smell like they should be smoked, but contain few mind-bending cannabinoids, if any, and the resin is not very psychoactive. Male plants contain much less THC and are harvested before they pollinate females. Female plants are harvested when trichomes show peak ripeness. Leaves are harvested first.

Manicuring plants takes a long time. One pound (454 gm) takes four to six hours to manicure by hand with scissors and one to two hours to manicure with an automatic trimmer.

Growers hang plants upside down because it is simple, convenient, and effective; not to drain existing THC-potent resin into the buds. Also, boiling roots to extract THC is crazy!

Leaves

Once the large leaves are fully formed, THC potency has generally peaked out. Smaller leaves around buds continue to develop resin until buds are ripe. Peak potency is retained, as long as leaves are healthy and green; nothing is lost by leaving them on the plant. Harvest leaves if they show signs of disease or rapid yellowing that fertilizer has failed to cure. Once they start to yellow and die, potency decreases somewhat. This is true especially with fan leaves that grow before the buds. The large leaves turn yellow when nitrogen-rich fertilizer is withheld during flowering.

Cut the entire leaf, including the leaf stem (petiole) and toss it into a bag. Paper bags breathe well and can be closed by folding over the top. Plastic bags do not breathe, so the top must be left open. If the petiole is left on the stem, it shrivels and dies back. This little bit of dead plant attracts moisture and mold. Removing it will avoid mold problems.

Keep the paper bag in a closet or area with 40-60 percent humidity and 60-70°F (15-21°C) temperature. Reach into the bag once or twice a

Put leaves in an open plastic bag to dry. Stir once or twice daily to mix moist and dry leaves.

Trim large leaves from plants before manicuring small leaves around buds. Make sure to remove leaves including petiole at main stem to avoid promoting mold.

These big bags of dried leaf and trimmings are ready to be made into hash.

day and stir leaves by hand. Leaves should be dry to the touch in five to seven days. Once dry, place in the freezer to get ready to make Ice-O-Lator hash.

Male Harvest

Male flowers can produce pollen as early as two weeks after changing lights to the 12-hour day/night schedule. Watch out for early openers. Three to six weeks after initiating flowering, pollen sacks open and continue producing flowers for several weeks after the first pods have begun to shed pollen. Once male flowers are clearly visible but not yet open, THC production is at peak levels. (See "Sinsemilla Harvest" below for information on trichome glands.) This is the best time to harvest. Once males release pollen, the degradation process speeds up and flowers fall.

Harvest males carefully, especially if close to females. Cut the plant off at the base, taking care to shake it as little as possible. To help prevent accidental pollination by an unnoticed open male flower, carefully cover the male plant with a plastic bag, and tie it off at the bottom before harvesting. Or, if you can see an open pollen sack, spray it with water to make pollen unviable. Keep males used for breeding as far from flowering females as possible. Make sure to install fine screens for air coming into the flowering room and wet them down regularly to discourage rogue pollen. Isolate males until needed. After a month, the male will start reverting to vegetative growth even though it

Spray male plants with water to deactivate pollen before harvest.

retains viable sacks of pollen. Males can also be cloned and held in the vegetative stage until needed. Induce flowering about three weeks before viable pollen is needed. Within three to five weeks, the male will be full of viable pollen sacks.

Prolong male harvest by removing flowers with tweezers or fingernails as they appear. New flowers soon emerge after plucking old ones. Continue to remove pollen sacks until females are two weeks from full bloom. Picking off individual male flowers is a tedious, time consuming process, and it is easy to miss a few.

Harvesting most of the branches, leaving only one or two pollen-bearing limbs, is practical. A single male flower contains enough pollen to fertilize many female ovules; a single branch full of male flowers is necessary to produce enough pollen for most home breeding needs.

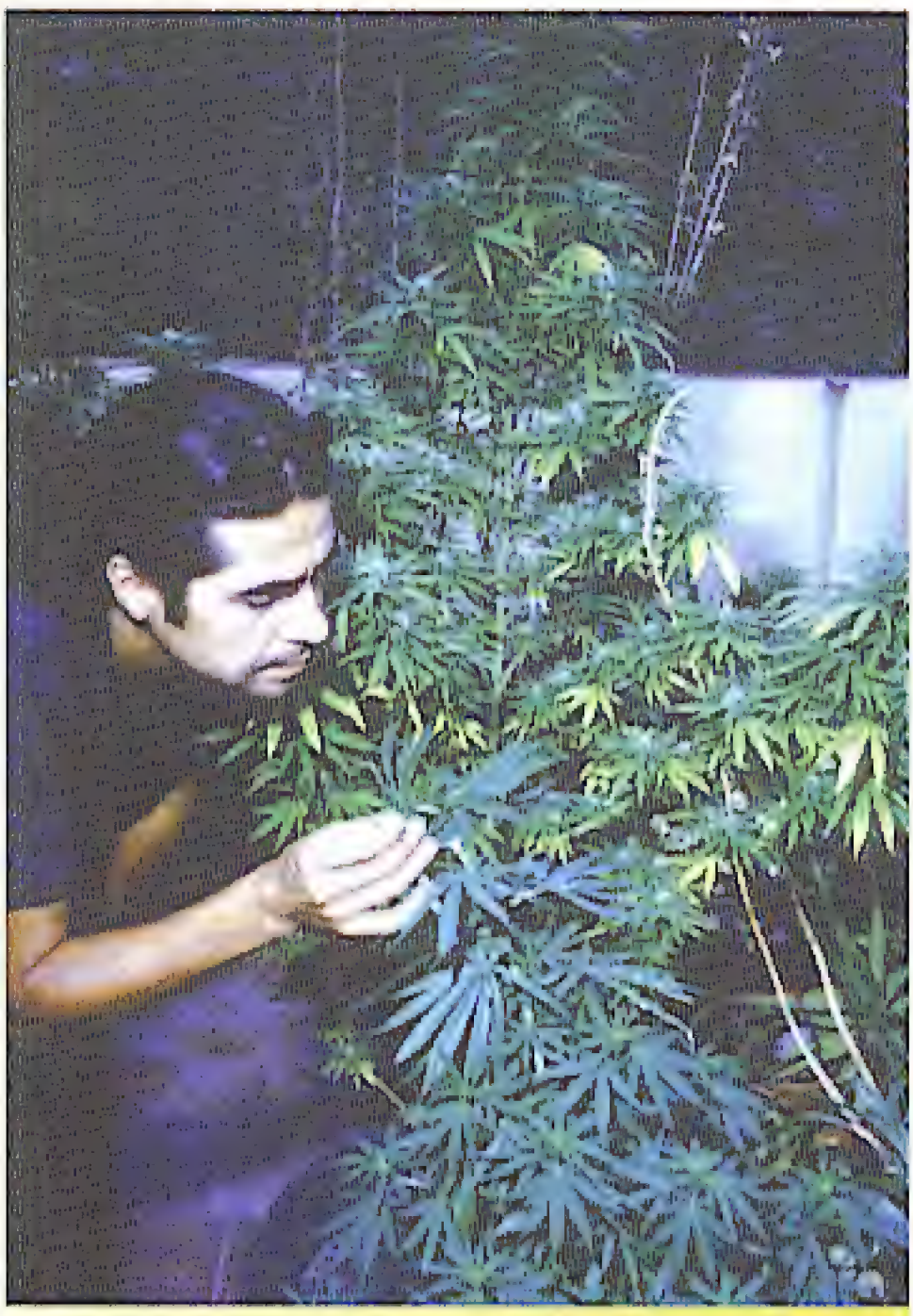
Cut a male branch from the plant to store and use later before harvesting.

Sinsemilla Harvest

Sinsemilla flowers are mature from 6-12 weeks after the photoperiod has been changed to 12 hours. The best time to harvest sinsemilla is when THC production has peaked but not yet started the degradation process. Established indoor varieties are bred so the entire plant

Cover male plants with a plastic bag to help contain pollen before removing from the garden.

Store male branches in a glass of water for several days. The pollen sacks will continue to open.



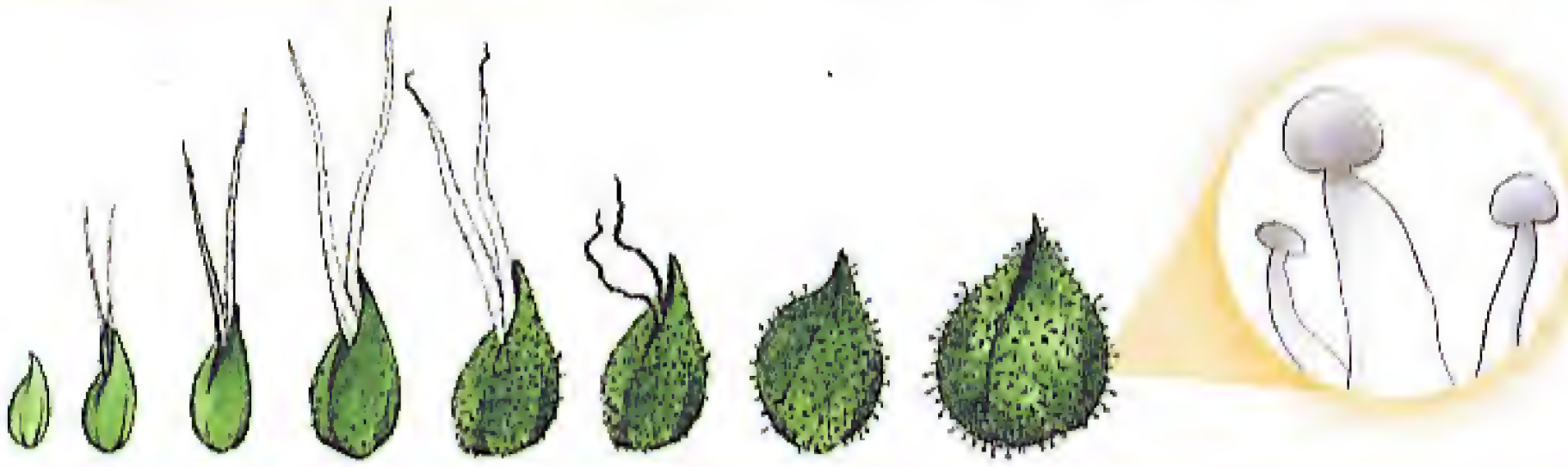
Carefully inspect buds for peak ripeness.

Trichomes fight for limited leaf space on this ripe bud. Notice all the pistils have died back and the trichomes are at peak maturity for harvest.

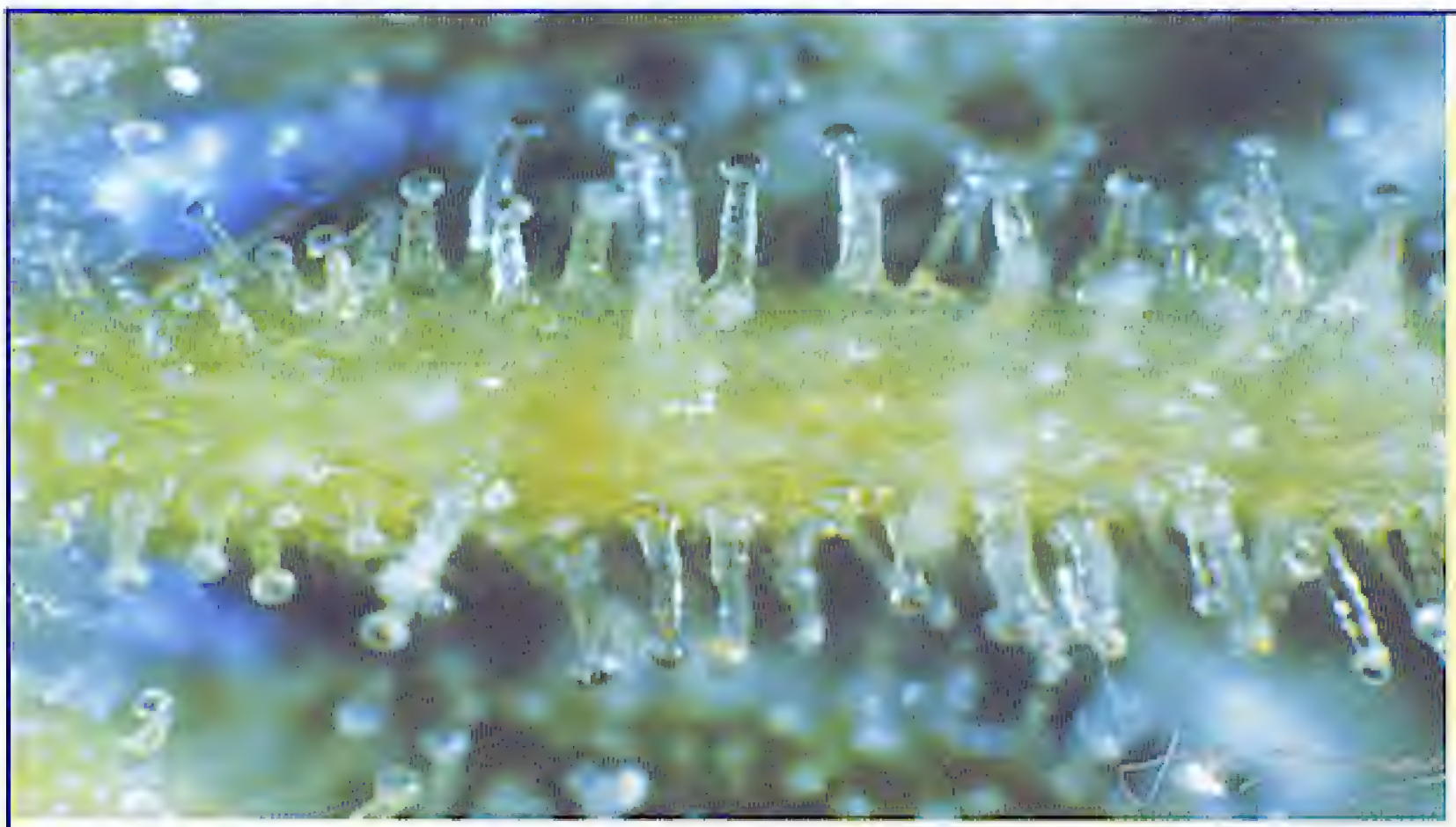
Long thin trichomes are common on most sativa-dominant strains. The underside of this leaf is packed with clear glands, some of which are turning amber.

Trichomes in the center of the photo have turned amber, and many have lost the ball on top. The plant was harvested to curtail further trichome degradation.

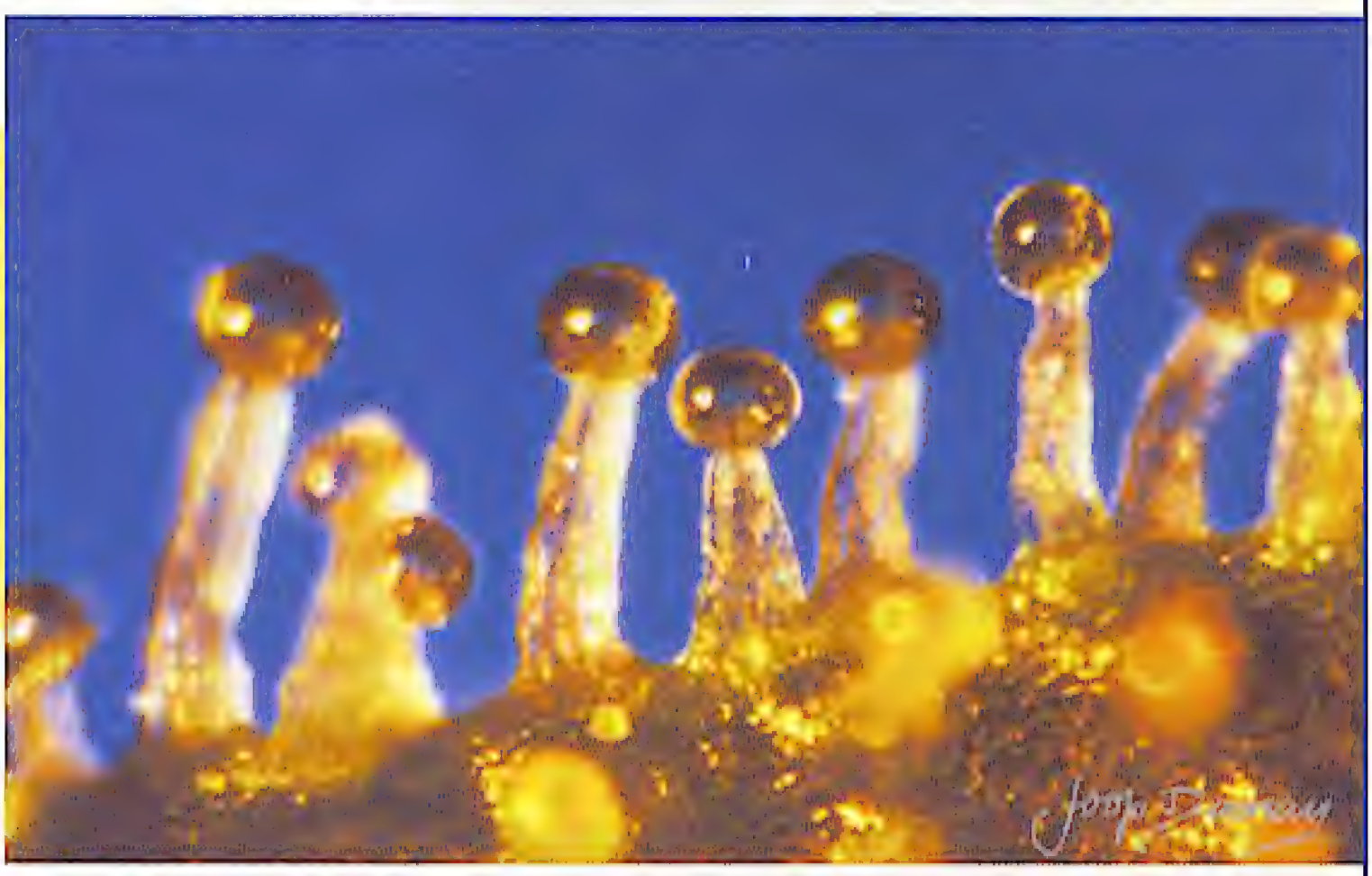
reaches peak potency at the same time. Lower flower tops that received less light are not as heavily frosted with resin as upper branches and could be slower to mature. Varieties that ripen all at once tend to go through four to five weeks of rapid bud formation before growth levels off. The harvest is taken one to three weeks after growth slows. Pure *indica* varieties and many *indica/sativa* crosses are picked six to ten weeks



Female calyx development is shown in early, middle, and late stages.



Early Harvest: These resin glands are in the early stages of formation. Harvest when the trichomes start to turn milky white to amber for the most potent THC.



Late Harvest: Colored light in this photo accentuates the amber color trichomes turn as the harvest window fades.

Photos on this page courtesy of Joop Dumay, the "Crystalman." www.crystalman.nl

Peak Harvest: Resin glands start to turn creamy white after trichomes are fully formed. These trichomes signify harvest time!

after inducing flowering, while *indica* crosses with more dominant *sativas*, such as 'Skunk #1', may not be ready for ten weeks. Commercial growers often pick immature six-week-old buds so they can harvest one more crop every year.

Pure *sativa* varieties, especially Thai and Asian strains that were grown from native seed, take longer to bloom after turning the light to 12 hours. They could take four months to finish blooming! These types tend to form buds at an even rate throughout flowering with no marked decline in growth rate. Few indoor growers have the time or patience to grow pure *sativa* varieties because of their long flowering period, leggy stature, and low yield. Buds at the top of the plant often reach peak potency a few days to a couple of weeks before lower buds. Long-blooming equatorial *sativas* may require several harvests.

Pistils turn from white to brown or brownish-red as the flower tops ripen. Pistils changing color indicates plants are turning ripe; however, it is not the best indicator of peak ripeness. After more hands-on research, I have learned that it is difficult to tell peak ripeness by the color of pistils in all strains. The best gauge of peak ripeness is the color of the resin glands or trichomes.

Resin glands change colors as they ripen. At first, glands are clear. As they continue to mature, they turn a translucent milky color and, finally, they turn amber. Resin glands that are bruised from being squeezed or jostled about deteriorate quickly. All glands do not change

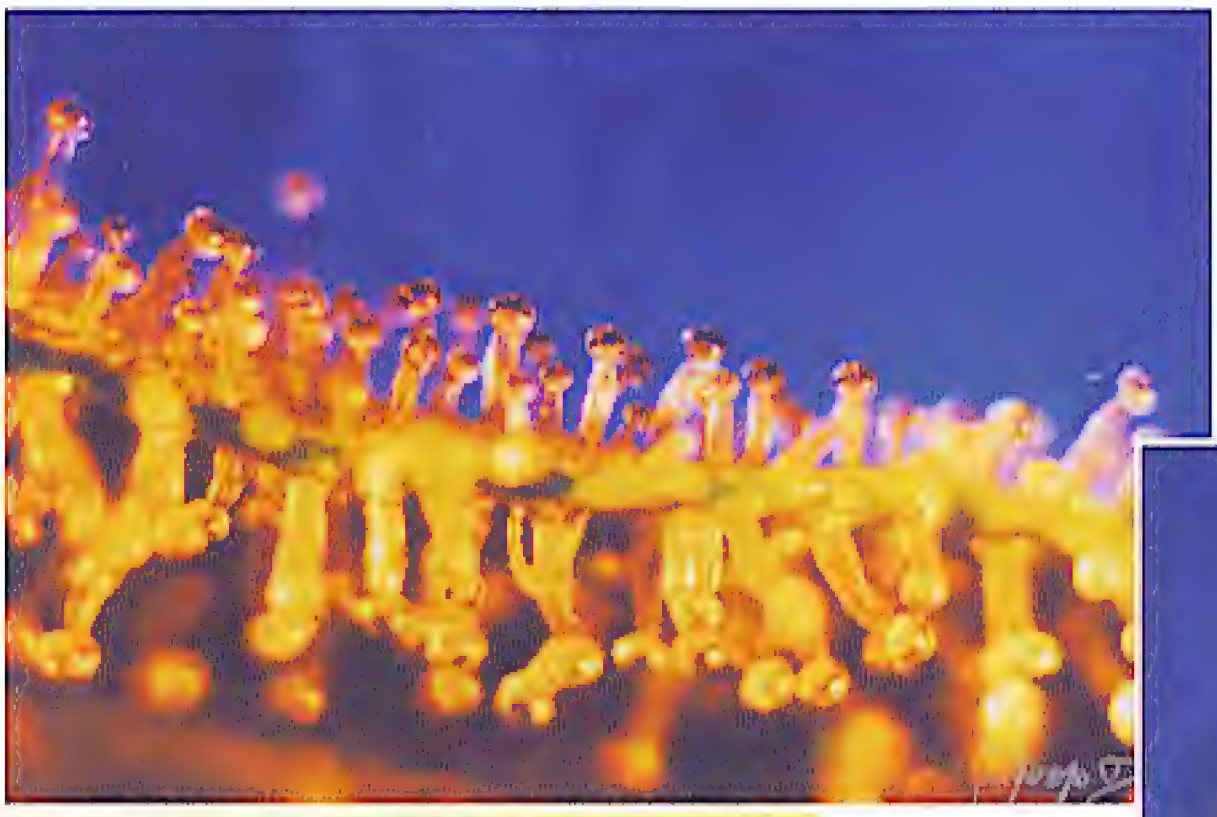
Close-up of a single resin gland was shot with a scanning electron microscope at 370X. THC is concentrated at the base of the "ball." 370X electron scanning photo courtesy Eirik.

Trichomes are very delicate and can be ruptured easily. Note the torn head on one trichome and the one in the foreground has lost its head completely! 80X electron scanning photo courtesy Eirik.

This scientist from Canna measures the exact THC content of harvested buds with a gas chromatograph.

A trichome is a "plant hair." The trichomes found on drug cannabis are glandular and secretory in character. These stalked glandular trichomes are comprised of a stalk with a resin head. They look like a post with the knob at the top. They form on buds and small leaves. The highest concentration of THC is located at the base of the resin head. The best time to harvest is when these trichomes have developed a spherical head and are still transparent. Senescing glands start to turn brown and get smaller; they are decomposing, and THC content diminishes. Check buds every day starting the sixth week of flowering. Check several buds from different plants to ensure the maximum amount of trichomes are ripe for harvest.

Cystolith trichomes have a pointed tip and are often long and hair-like. These protective trichomes are most common on leaf undersides. Cystolith glands exude insecticidal and miticidal substances to gum up pest mouthparts and repel them, but they have no THC.



The glandular trichomes in this photo are short and stout. Crystalman added color to this photo to provide perspective.

This close up photo by Crystalman shows a single long tall resin gland that is perfectly ripe.

Photos on this page courtesy of Joop Dumay, the "Crystalman." www.crystalman.nl

You can clearly see stalked trichomes, the clear column with a ball on top that contains much THC. Hair-like pointed cystolith hairs contain virtually no THC.

Harvest when half (50 percent) of the trichomes have turned a creamy translucent color for absolute peak ripeness. At this point, the high will be both cerebral and physical with a good head and body stone.

Harvest when the majority of trichomes have turned amber for a body stone. Pure *indica*, *afghani*, and *indica*-dominant strains harvested at this late point will possess a heavy body, or couch-lock, stone. Waiting to harvest pure *sativa* and *sativa*-dominant varieties until this stage will not take advantage of the strains. Such strains are best harvested when resin glands are clear to milky colored.

Harvest Step-by-Step

Step One: Stop fertilization seven to ten days prior to harvest. Latent nutrient accumulation in foliage imparts a fertilizer-like taste. Leach nutrients from the growing medium seven to ten days before harvest. Some growers continue to fertilize until three days before harvest if using a product such as Final Flush®. Such products expedite flushing built-up chemicals from cannabis plants.

Step Two: If sprays have been applied during the last week (not recommended), mist plants heavily to wash off undesirable residues that may have accumulated on foliage. The bath will not affect resin production. Gently jiggle buds after rinsing to shake off any standing water. To prevent fungus and bud blight, wash the garden early in the day to allow excess water on leaves to dry before nightfall. If bud mold (*botrytis*) is a threat, DO NOT wash buds.

Step Three: You may want to give plants 24 hours of total darkness before harvest. Many growers do this and say the buds are a little more resinous afterward.

Step Four: Harvest in the morning when THC content is at its peak. Harvest entire plant or one branch at a time by cutting near the base with pruners. Jerking the root ball creates a mess and is unnecessary. All of the THC is produced in the foliage, not in the roots.

Step Five: It is not necessary to hang plants upside down so all the resin drains into the foliage. Once formed, resin does not move. However, drying the entire plant by hanging it upside down is very convenient. When stems are left intact, drying is much slower.

Step Six: To harvest entire plants and/or branches:

a. Remove large leaves one or two days before actually cutting the plants down. Or remove leaves after cutting plants. Harvesting large leaves early gets them out of the way and makes manicuring easier and faster.
b. Harvest entire plants by cutting them off at the base before manicuring.
c. Or cut each branch into lengths of 6-24 inches. Manicure the freshly harvested tops, trimming away leaves with clippers or scissors. Hang the manicured branches until dry. Once dry, cut the tops from the branches, taking special care to handle tender buds as gently as possible.
d. Or leave larger leaves on branches to act as a protective sheath to flower buds. Tender resin glands are protected from bruises and rupture until final manicuring, but, manicuring is much slower and more tedious when trimming dry foliage.

Manicuring

Once harvested, carefully manicure buds by cutting large leaves where they attach to the stem. Leaving the petiole (leaf stem) can cause mold to grow. Snip off smaller, low-potency leaves around buds that show little resin, so a beautiful THC-potent bud remains.

Manicuring is easiest when leaves are soft and supple immediately after harvest. Trimming off leaves now will also speed drying. Waiting until foliage is dry to manicure will make manicuring buds a tedious, time-consuming job.

Manicuring is easiest with a good pair of trimming scissors that has small blades to facilitate reaching in and snipping off leaf petioles at the

main stem. An ergonomic pair of scissors with comfortable handles is indispensable when manicuring cannabis for hours.

Manicure over a fine silkscreen (see Chapter 15, "Hash") or a glass table. Scrape up fallen resin glands on the table or under the screen. This potent resin can be smoked immediately or pressed into blocks of hash.

Wear inexpensive rubber gloves to collect "finger hash." After trimming for a few hours, remove accumulated finger hash on gloves by bathing in a small portion of isopropyl alcohol. Set the hash-laden alcohol on the counter overnight to evaporate. Scrape up the remaining hash after all the alcohol has evaporated. Or put the rubber gloves in a freezer for a few hours. Cooling will make it easier to scrape and rub the accumulated hash from the gloves.

Scrape accumulated resin from scissors when it impairs blade movement. Use a small knife to remove built-up resin from blades. Ball up small bits of scraped resin by rubbing it together between fingers. The ball of hash will grow as manicuring progresses.

Budget enough time to harvest and manicure your crop. Properly manicuring one pound (454 gm) takes from four to six hours by hand with scissors and one to two hours when using an automatic trimmer.

Looking at a wall of buds is impressive, but it tends to loose its luster after manicuring by hand for a few days.

Remove large leaves by cutting the petiole where it meets the main stem.

Cut the main stalk at the base to harvest entire plant at once.

Remove individual branches and hang from drying lines after manicuring to speed drying and reduce workload.

Drying

After harvest, marijuana must dry before smoking. Drying converts THC from its non-psychoactive, crude, acidic form to its psychoactive neutral form. In other words, fresh green marijuana will not be very potent. Drying also converts 75 percent or more of the freshly harvested plant into water vapor and other gases.

When you cut a plant or plant part and hang it to dry, the transport of fluids within the plant continues, but at a slower rate. Stomata close soon after harvest, and drying is slowed since little water vapor escapes. The natural plant processes slowly come to an end as the plant dries. The outer cells are the first to dry, but fluid still moves from internal cells to supply moisture to outer cells which are dry. When this process occurs properly, plants dry evenly throughout. Removing leaves and large stems upon harvest speeds drying; however, moisture content within the "dried" buds, leaves, and stems is uneven. If buds are dried too quickly, chlorophyll and other pigments, starch, and nitrates are trapped within plant tissue, making it taste "green," burn unevenly, and taste bad.

When dried relatively slowly, over five to seven days or longer, moisture evaporates evenly into the air, yielding uniformly dry buds with minimal THC decomposition. Slowly dried buds taste sweet and smoke smooth. Taste and aroma improve when pigments break down. Slow even drying–where moisture content is the

Bonsai electric scissors work on AC or DC current. This great invention for guerilla and indoor growers cuts trimming time by two thirds or more. The poster in the background is Napoleon on the cover of Newsweek magazine!

The Aardvark trimmer attaches to a vacuum which whisks all trim into a tidy bag. Put flexible hose in the freezer and shake out accumulated resin an hour later.

same throughout stems, foliage and buds–allows enough time for the pigments to degrade. Hanging entire plants to dry allows this process to take place over time.

To speed drying time, remove large leaves and stems upon harvest. Fresh supple leaves are easier to work with than when dry. When you are looking at manicuring 10 pounds (4.5 kg), you make it as easy as possible!

Plants with outer "fan" leaves intact take longer to dry and require much more time to manicure. The outer leaves form a sheath that helps protect delicate trichomes when drying, but this practice turns trimming dry leaves into a tedious, messy, two-step job.

Circulation and ventilation fans will help control heat and humidity and keep them at proper levels. You can also use a dehumidifier to control humidity. An air conditioner is ideal to "dial in" temperature and humidity in warm climates. Large drying areas may require a heater to raise temperature and lower humidity. Do not train fans directly on drying plants; it causes them to dry unevenly.

For best results, drying should be slow. Ideal air temperature is between 65 and 75°F (18-24°C) and humidity from 45 to 55 percent. Temperatures below 65°F (18°C) slow drying, and humidity often climbs quickly. Humidity above 80 percent extends drying time and makes the threat of bud mold imminent. Temperatures above 75°F (24°C) may cause buds to dry too fast, and humidity can also fall below the ideal 50 percent level more easily. Temperatures above 85°F (29°C) cause buds to dry so fast that smoke becomes harsh. Relative humidity below 30-40 percent causes buds to dry too fast and retain chlorophyll, giving them a "green" taste. Fast-dried buds become crispy and crumble. Low humidity also causes buds to lose flavor and odor. If humidity is between 30 and 40 percent, allow for minimum air movement to slow drying. Always use an accurate maximum/minimum thermometer and hygrometer to ensure temperature and humidity are kept in the ideal range.

The Grass Chopper is one of the many new medium-sized bud trimmers that feature vacuum leaf removal.

Scrape resin from scissors and ball up into hash. Remove accumulated resin from gloves with alcohol or put in the freezer to facilitate separation.

Trim buds over a screen or glass table to collect resin glands. Scrape up glands and press into hash.

This ingenious grower made a bud trimmer by duct taping a couple of pieces of metal and a drill to a workbench.

This grower dried his one-pound (450 gm) crop in a small closet. Two levels of drying lines were stretched across the closet.

Shantibaba (Mr. Nice Seeds) constructed drying racks from Mecalux angleiron and put wheels on the bottom to facilitate handling and storage.

Small harvests can easily be dried in a closet, cabinet, or a cardboard box that is a fraction of the growing area's size. Large harvests require much more room. If drying space is a problem, a staggered planting schedule, or planting varieties that ripen both early and late, carries over to a staggered harvest that frees up drying space as buds dry.

Large outdoor and indoor crops need large spaces in which to dry. You can use the grow area as a drying room if not growing any plants. Do not dry plants in the same room in which plants grow. Different climates are required for growing marijuana and drying it. Fungus and spider mites can also migrate from dead plants to live ones. Inspect drying buds daily for any signs of fungus, mold, and spider mites. Smear Tanglefoot™ around the end of drying lines to form a barrier which keeps mites from migrating to live plants. Mites congregate at the barrier and are easy to smash.

A cardboard or wooden box makes an excellent drying space to hang small harvests. The air flow in the enclosed area is diminished, and buds and leaves must be turned daily to even out the moisture content and discourage mold. Thread a large needle with dental floss, and string the floss back and forth through the box near the top to make drying lines. If the box is tall enough, you can install several levels of drying lines. Lock the flaps on the box and set it in a closet or spare room. Open flaps to allow air circulation as needed. Or, cut holes near the bot-

This harvest took longer to dry because it was not manicured until after it dried.

tom and top of the box to allow air exchange and circulation. Check daily to see how buds are drying. If tops dry too fast, open the box-top and set the box in a cooler location.

Hanging plants is a labor-saving way to facilitate slow, even drying. Large, moist stems can also be removed and small branches hung from the ceiling to cut drying time by a few days.

Use clothespins to attach branches to drying lines, or poke a paper clip through the base of branches and hang clip from line. Another option is to trim branches to form a hook and hang from the "hook."

Use a portable foldable clothesline to make a quick mobile drying room. Unfold clothesline, hang buds from lines, and cover with a large, black bed sheet or cloth. The cloth sheet allows the exchange of air and maintains darkness. Train a fan on the outside of the sheet so air circulates underneath and dries buds.

Building a small drying room is as easy as tacking some plywood together at right angles and hanging lines across the enclosure. Or you can make walls from black Visqueen™ plastic by tacking or taping it to the ceiling and floor to form walls.

Drying a large harvest can require a large space. If you have a large space such as a bedroom, barn, shed, etc., cut plants at the base and remove large leaves, and hang on drying lines in the room. Cut branches from 12-40 inches (30-100 cm). Manicure each branch and hang on drying lines to complete the drying process.

Save space by building or buying drying racks for the buds. Make drying racks from window screen or plastic agricultural netting. Stretch the screen or netting over a wooden frame and secure with staples. Put three- to six-inch (8-15-cm) spacers between framed screens to allow adequate airflow. Or build a drying box with removable screens. See photo above.

Hang manicured buds to dry for a day or two before placing on drying screens to allow the bulk of the moisture to dissipate. Once on

A simple drying box is easy to make. Wooden spacers between boxes allow for adequate air flow.

screens, buds should be turned daily to ensure even drying.

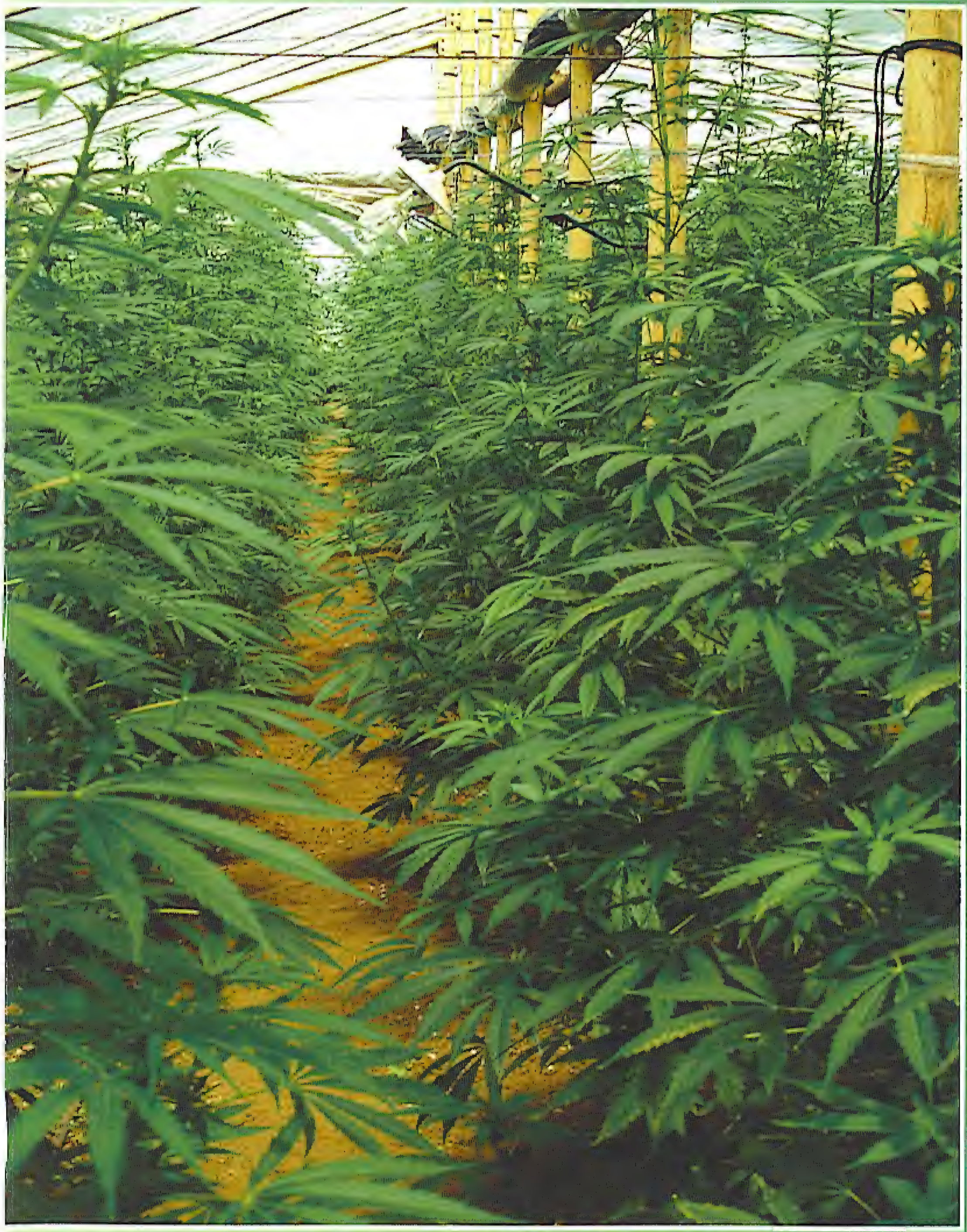
Manicured buds can also be placed in boxes to dry. Move buds daily so new surfaces are exposed to air. Buds dry slower, because the air flow is reduced. Line boxes with plastic or aluminum foil to contain for collection resin glands that fall to the bottom. To contain resin glands, seal cracks in boxes with tape.

Drying time depends upon temperature, humidity, and bud density. Most buds will be dry enough to cure in five to seven days. Big, fat, dense buds can take three to four days longer. Gently squeeze buds after they dry for a few days to check for moisture content. Bend stems to see if they are done. If the stem breaks rather than folds, it is ready to cure.

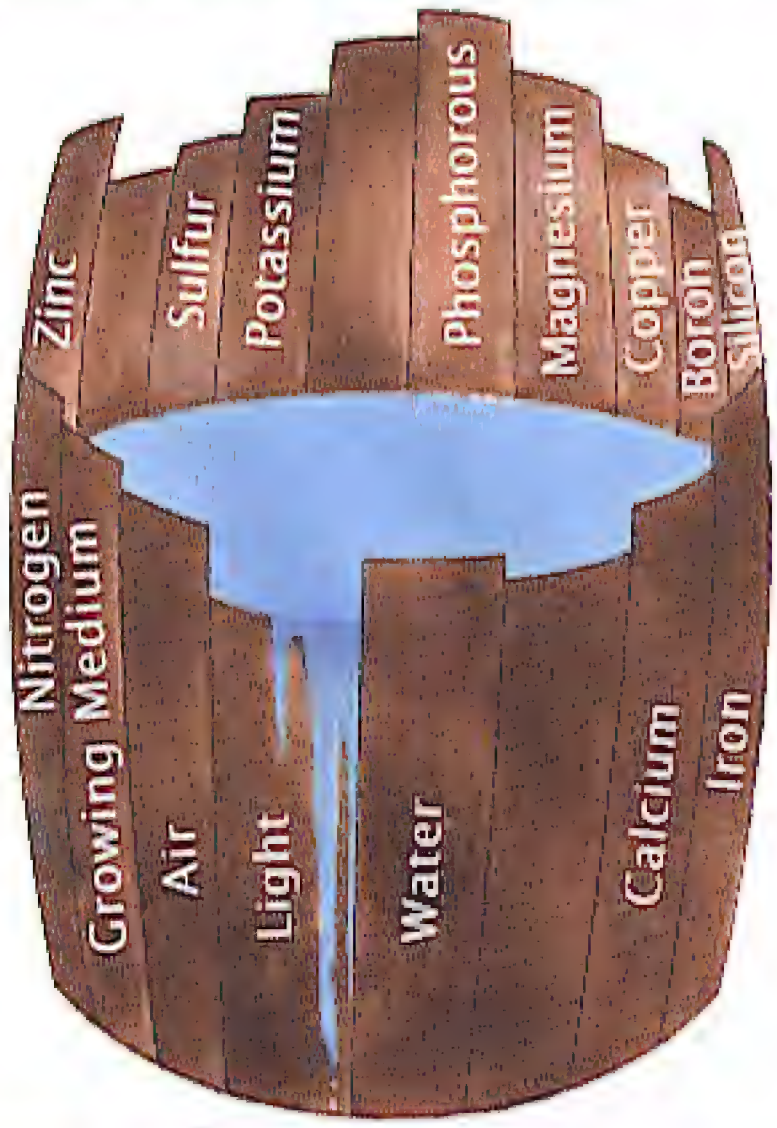
Check for dryness by bending a stem. *The stem should snap rather than fold when bent.* The bud should be dry to touch, but not brittle. The bud should burn well enough to smoke when dry.

Light (UV rays), heat, and friction hasten biodegradation and are dry and drying, marijuana's biggest enemies. Keep dried marijuana off

Chapter SIX
GROW ROOMS & GREENHOUSES



Female plants in this Colombian greenhouse are sheltered from daily rains.



This barrel full of water shows that cannabis will grow only as fast as its most limiting factor. Light is most often the factor that limits growth indoors.

Air	**20%**
Temperature	
Humidity	
CO_2 and O_2 content	
Light	**20%**
Spectrum (color)	
Intensity	
Photoperiod (hours of light per day)	
Water	**20%**
Temperature	
pH	
EC	
Oxygen content	
Nutrients	**20%**
Composition	
Purity	
Growing Medium	**20%**
Air content	
Moisture content	

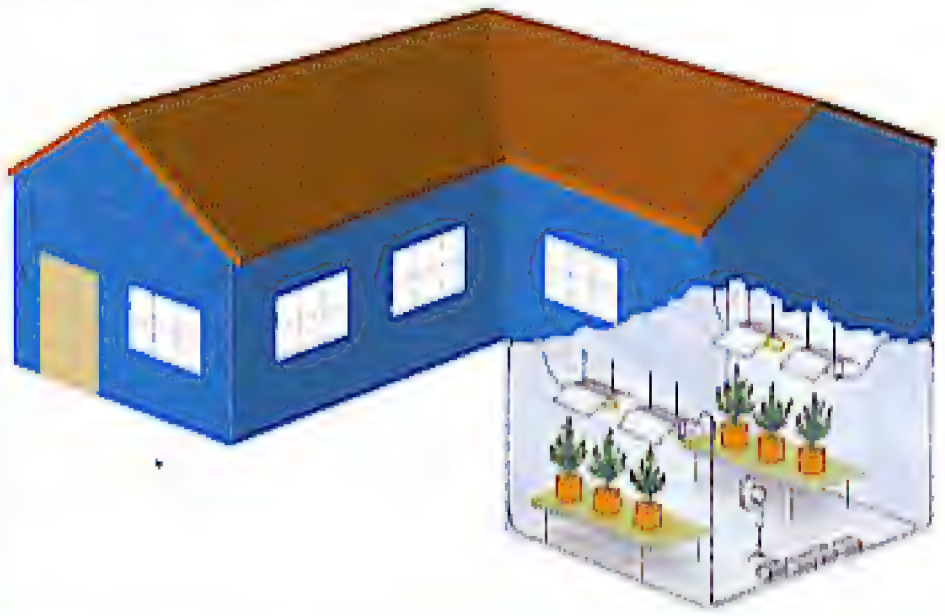
About Grow Rooms

Basement

The best location for a grow room is in an obscure corner of a basement, where the temperature is easy to keep constant year round. Basements are well insulated by concrete walls and soil. A basement room can be enclosed and camouflaged with junk, a double wall, workbench, or shelving.

Added security is afforded by installing a false door in a closet. The grow room is located behind the secret door. Another good secret location, except for the possible heat build-up, is the attic. Few people venture to an attic that is difficult to access. Some growers locate their gardens below a trapdoor covered with a rug.

Law enforcement cannot use the electricity bill as sole grounds for a search warrant. But, they can use it along with other "evidence" such as remnants of indoor growing visible outdoors, thermal image heat signatures, snitch testimony, etc., to secure a search warrant. As long as the marijuana grown is not sold or shown to a snitch, there should be no reason for any suspicion. Thermal image technology is easy to outwit. Just keep the lights on during daylight hours to confuse the technology. Or, cool exhaust air and expel it under the well-insulated grow house so it does not leave a heat trail.



This cutaway basement grow room shows a real scenario. Plants on tables stay warmer and are easy to maintain.

Outbuildings, garages, and barns not attached to homes are some of the worst places to grow cannabis. Thieves and law enforcement often do not regard entering a barn or garage as a crime, though they would not consider entering a home. Security is much better when the garden is within the home.

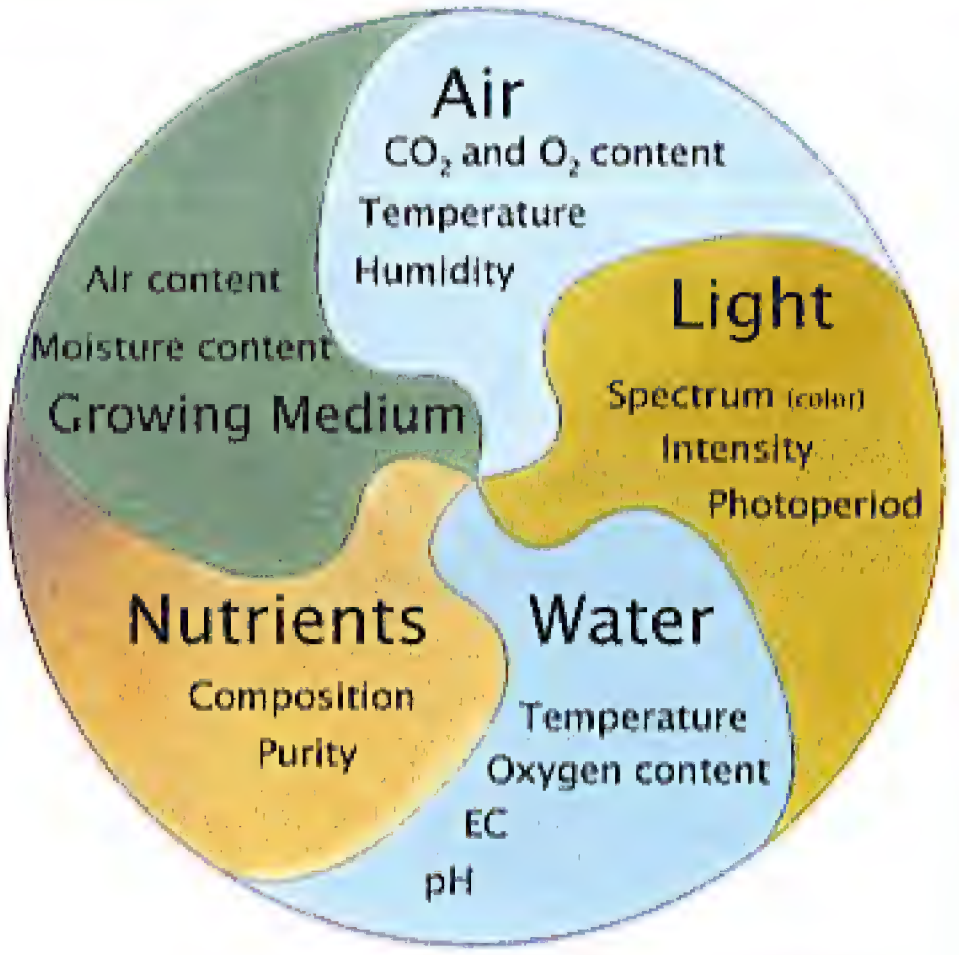
Although less common, there are even grow rooms on wheels! Some innovative growers have remodeled trailer houses and buses into grow rooms. One of my favorite grow rooms was in a tricked-out trailer. Another was in a 60-foot (18 m) sailing yacht!

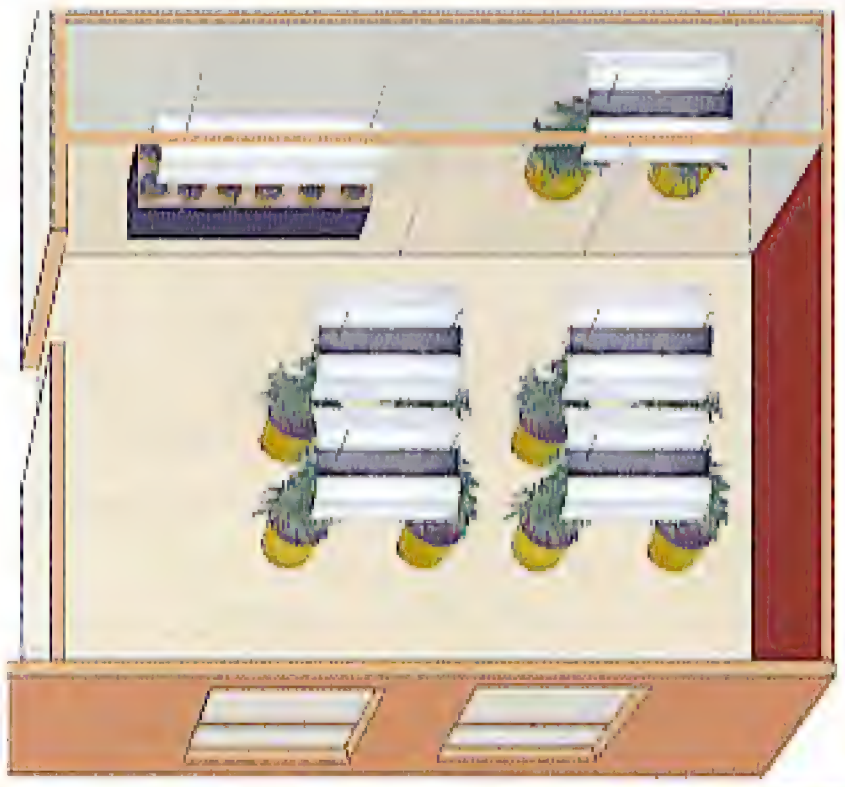
The grow room's size determines the size and the number of lamps. High intensity discharge (HID) lamps that work well to grow marijuana are available in wattages of 150, 175, 250, 400, 600, 1000, and 1100. Smaller wattages from 150-400, work well in closets or spaces with 9-21 square feet (0.8-2 m^2) of floor space. Use 600-watt and larger bulbs for larger areas.

The drawings show several grow room floor plans. As the floor plans demonstrate, there are several basic approaches to grow room design and production. Most growers start out with a crop grown in a single room. After they harvest the crop, they introduce a new batch of clones. The photoperiod is switched back to 18 hours, and the cycle continues.

The most productive setups utilize two rooms. The first room is for vegetative growth, mother plants, and rooting clones. This room should be about one-quarter the size of the flowering room. When the flowering room crop is harvested, plants from the vegetative room are moved into the flowering room.

Super productivity is achieved with a perpetual crop. Several clones are taken every day or every week. Every day a few plants are harvested. For every plant harvested, a new cutting takes its place.





This indoor setup has a big flowering room, a vegetative room, and a clone chamber.

This productive grow room is located in a closed-off corner of the basement.

Take a little time to set up your grow room so all the space is used efficiently.

This closet grow room has everything necessary to grow a crop–lights, fans, and cannabis! A 400-watt HID lights the 3 × 4-foot (90 ×120 cm) flowering room above, and two 55-watt CFLs in one reflector illuminate mothers and clones in this perpetual harvest setup.

A single 1000-watt metal halide can grow enough mothers, clones, and vegetative plants to support 4000 watts of flowering HID light. This design allows pungent odors to waft upward before being evacuated via roof fans. A third area in the attic is used as a heat buffer in hot climates.

Setting Up the Grow Room-Step-by-Step

Set up the grow room before introducing plants. Construction requires space and planning. A grow room under construction offers a terrible environment for plants. Once the grow room is set up and totally operational, it will be ready for plants.

Step One: Choose an out-of-the-way space with little or no traffic. A corner of the basement or a spare bedroom are perfect. A 1000-watt HID, properly set up, will efficiently illuminate up to a 6 × 6-foot (1.8 x 1.8 m) room. The ceiling should be at least five feet (1.5 m) high. Keep in mind that plants in containers are set up at least one foot (30 cm) off the ground, and the lamp needs about a foot (30 cm) of space to hang from the ceiling. This leaves only three feet (90 cm) of space for plants to grow. If forced to grow in an attic or basement with a low four-foot (120 cm) ceiling, much can be done to compensate for the loss of height, including cloning, bending, pruning, and using smaller wattage lamps.

Step Two: Enclose the room, if not already enclosed. Remove everything that does not pertain to the garden. Furniture, drapes, and curtains may harbor fungi. An enclosed room allows easy, precise control of every-

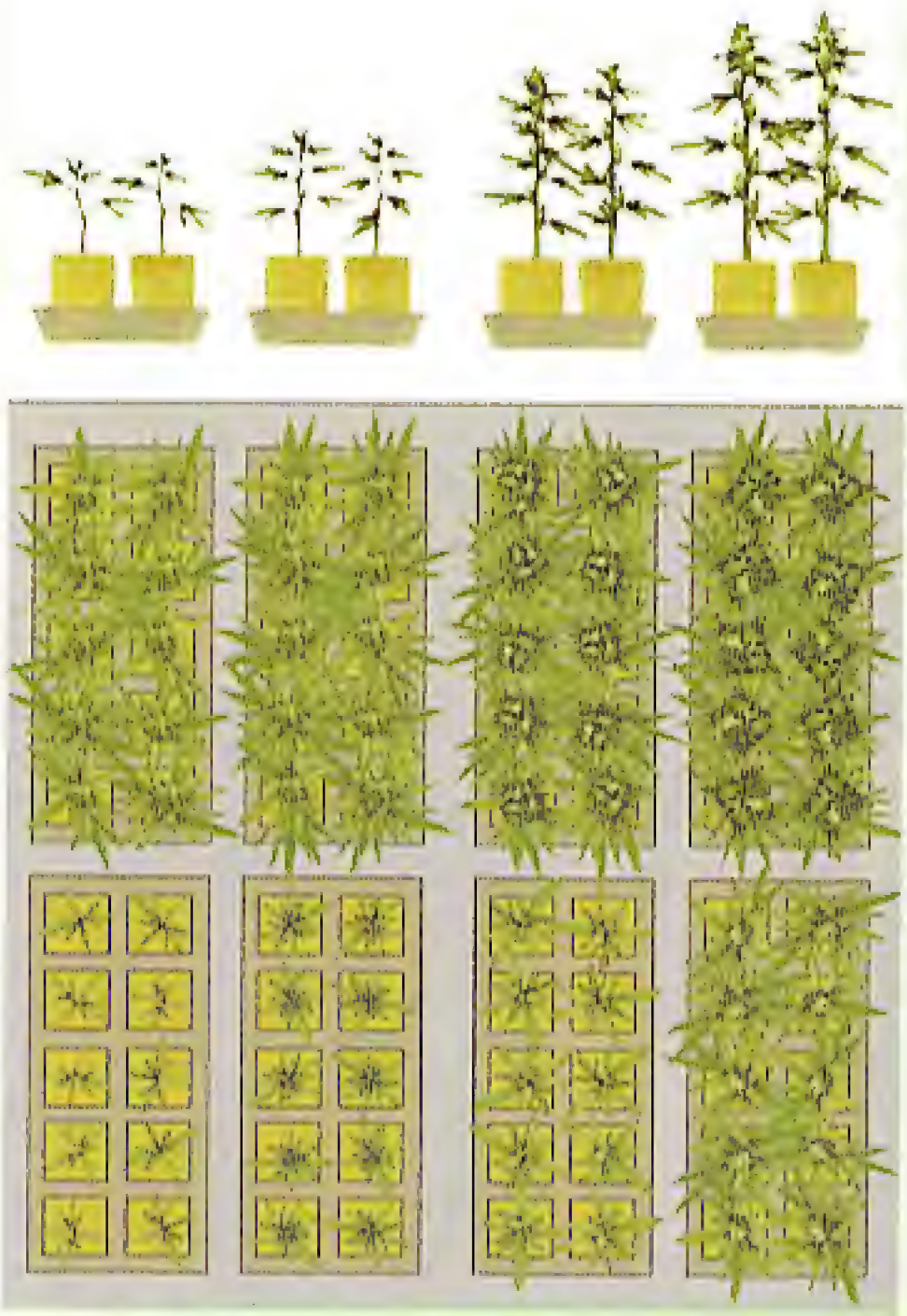
This attic grow room has access via a retractable ladder. The grower uses the dead airspace above the room for his ozone generator to exchange air before expelling.

thing and everyone that enters or exits, as well as who and what goes on inside. For most growers, enclosing the grow room is simply a matter of tacking up some plywood or fabricating plastic walls in the basement or attic and painting the room flat white. Make sure no light is visible from outside. If covering a window, do so discreetly–it should not look boarded up. Insulate windows and walls so a telltale heat signature does not escape. Basement windows often are painted to look like the foundation. Place some stuff–books, personal effects, household goods, etc.–in front of the window, and build a box around the things so a natural scene is visible from the outside. At night, bright light leaking through a crack in an uncovered window is like a beacon to curious neighbors or bandits.

Step Three: Cover walls, ceiling, floor–everything–with a highly reflective material like flat white paint or Mylar. The more reflection, the more light energy available to plants. Good reflective light will allow effective coverage of an HID lamp to increase from 10 to 20 percent, just by putting a few dollars worth of paint on the walls. Reflective white Visqueen® plastic is inexpensive and protects walls and floors.

Step Four: See "Setting Up the Vent Fan" in Chapter Thirteen. Constant air circulation and a supply of fresh air are essential but often inadequate. There should be at least one fresh-air vent in every grow room. Vents can be an open door, window, or duct vented to the outside. An exhaust fan vented outdoors or pulling new air through an open door usually creates an adequate flow of air. An oscillating fan works well to circulate air. When installing such a fan, make sure it is not set in a fixed position and blowing too hard on tender plants. It could cause windburn and dry out plants, especially seedlings and clones. If the room contains a heat vent, it may be opened to supply extra heat or air circulation.

This attic grow room is insulated with Styrofoam and reflection/anti-detection barrier foil available at www.hysupply.nl, which keeps the heat signature from showing.



In this simple Sea of Green layout, there are ten plants in each tray (80 total plants) illuminated by a single 1000-watt HID. Each week one tray of ten plants is harvested, and ten new plants are started.

These plants are growing in 3-gallon (11 L) pots and spaced on 6-inch (15 cm) centers. The 5-foot (2 m) high walls are covered with white Visqueen plastic.

Keeping heat inside the room is as important as keeping it out! Insulation will keep heat out, and the heat generated inside the room will be easy to control.

Step Five: The larger your garden becomes, the more water it will need. A 10 × 10-foot (3 x 3 m) garden could use more than 50 gallons (190 L) per week. Carrying water is hard, regular work. One gallon (3.8 L) of water weighs eight pounds (3.6 kg); 50 × 8 = 400 pounds (180 kg) of water a week! It is much easier to run in a hose with an on/off valve or install a hose bib in the room than to schlep water. A three-foot (90 cm) watering wand attached to the hose on/off valve makes watering easier and saves branches from being broken when watering in dense foliage. Hook up the hose to a hot and cold water source so the temperature is easy to regulate.

Step Six: Ideally, the floor should be concrete or a smooth surface that can be swept and washed down. A floor drain is very handy. In grow rooms with carpet or wood floors, a large, white painter's drop cloth or thick, white Visqueen plastic, will protect floors from moisture. Trays placed beneath each container add protection and convenience.

Step Seven: Mount a hook strong enough to support 30 pounds (14 kg) for each lamp. Attach an adjustable chain or cord and pulley between the ceiling hook and the lamp fixture. The adjustable connection makes it easy to keep the lamp at the proper distance from plants and up out of the way during maintenance.

Step Eight: There are some tools an indoor gardener must have and a few extra tools that make indoor horticulture much more precise and cost effective. The extra tools help make the garden so efficient that they pay for themselves in a few weeks. Procure all the tools before bringing plants into the room. If the tools are there when needed, chances are they will be put to use. A hygrometer is a good example. If plants show signs of slow, sickly growth due to high humidity, most growers will not identify the exact cause right away. They will wait and guess, wait and

guess, and maybe figure it out before a fungus attacks and the plant dies. When a hygrometer is installed before plants are brought into the grow room, the horticulturist will know from the start when the humidity is too high and causing sickly growth.

Step Nine: Read and complete: "Setting Up the HID Lamp" at the end of Chapter Two.

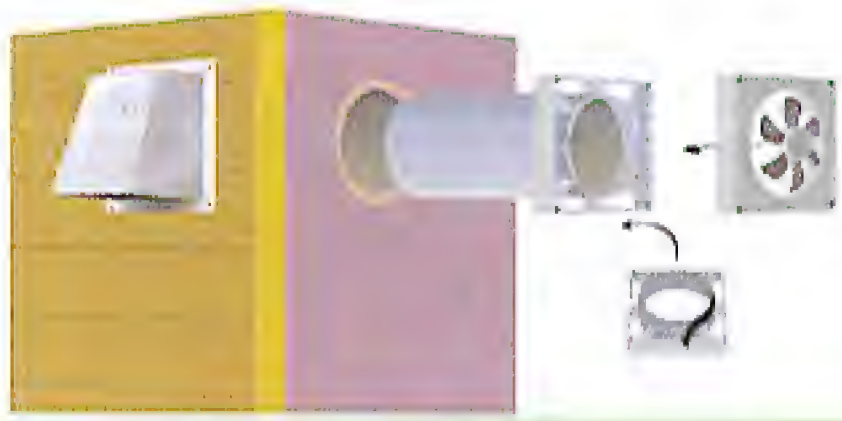
Step Ten: Move seedlings and rooted clones into the room. Huddle them closely together under the lamp. Make sure the HID is not so close to small plants that it burns their leaves. Position 400-watt lamps 18 inches (45 cm) above seedlings and clones. Place a 600-watt lamp 24 inches (60 cm) away and a 1000-watt lamp 30 inches (75 cm) away. Check the distance daily. Hang a precut string from the hood to measure distance.

Greenhouses and Cold Frames

This simple overview of greenhouses and cold frames will give you a feeling of what to look for and how to plan your project and reap a heavy harvest. Several links below will help you tap into the wealth of information on greenhouses and cold frames.

Greenhouses, cold frames, and hot frames are all useful in extending the growing season and/or protecting new plants and seedlings. Which type of structure you select depends on the size and location of your growing area, how much money you have to spend, how much time you have to grow, and security issues. Simple cold frames and hot frames can be assembled from common materials like old framed window panes and hay bales. Greenhouses are generally larger and more complex. They can be expensive to build and maintain but offer more flexibility for growing time and building use.

When deciding on a growing structure, first carefully analyze the project on paper. Consider how much space you have for the



This drawing shows how to install a vent fan. Adding rubber feet or padding around the fan will dampen noise.

A vent fan and an oscillating circulation fan are essential to maintain a healthy environment.

A watering can works well in small gardens and to apply small amounts of fertilizer.

This carpeted bedroom is completely lined with reflective Visqueen plastic. Duct tape works very well to hold the overlapping Visqueen together even under moist conditions.

This Swiss grower anchored a strong steel beam to the ceiling from which he suspended all the lights.

footprint and how many plants you can grow safely. Cold frames are small and can be as simple as a glass or plastic frame set on the ground with no artificial heat source. Their basic function is to protect young plants and seedlings from wind and cold in the early spring, but they can also be blacked out to induce early flowering and harvest. Hot frames are similar in size and structure but provide heat through manure, electricity, steam, or a hot-water pipe (radiant heat). You may use a hot frame to raise early seedlings and clones, after which the structure can be converted into a cold frame. Both frames share the advantages of economy, simplicity, small size, and portability.

Both large and small greenhouses cost more money, time, and space. With the exception of the lightweight "hoop" house or miniature greenhouse, they are also more permanent. The type of greenhouse selected will be determined by the planned use of the space and where it will be located. A lean-to or attached greenhouse will probably be smaller and less expensive to build than a freestanding structure.

Necessary Tools:

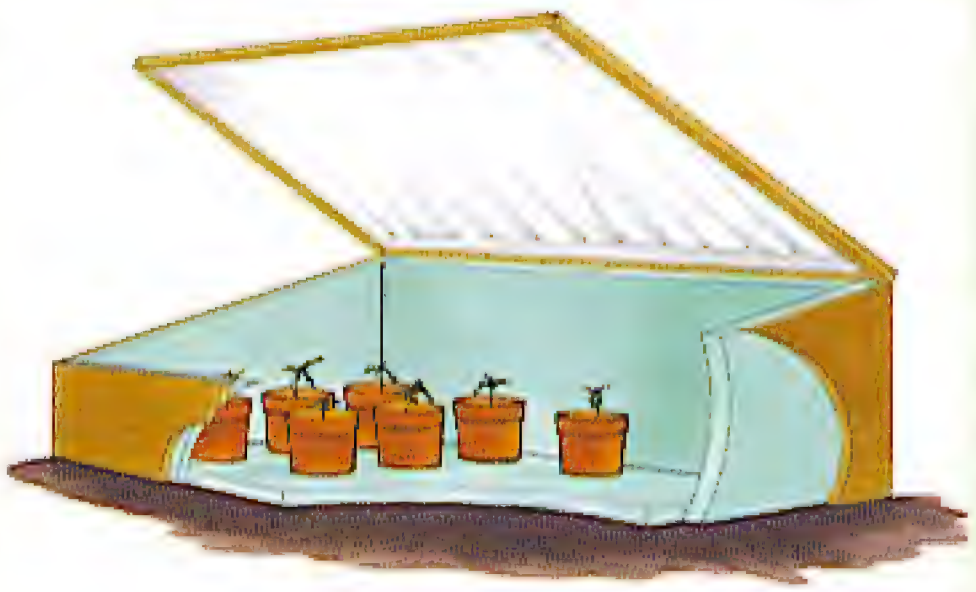
Thermometer
Spray bottle
pH tester
Liquid biodegradable soap
Hygrometer
Pruners or scissors
Wire ties
Sheetrock screws
Screwdriver
Measuring cup and spoons
Pencil and notebook
Moisture meter
Light meter
Yardstick to measure growth!

Total area of the greenhouse is determined by the number of plants you intend to grow. Allow one square yard (90 cm^2) per mature plant. Do not forget to allow about six inches (15 cm) space for air circulation between benches and side-walls. Add space for walkways–standing room only or room for a wheelbarrow–and possibly a center bench. Glass, plastic panels, and sheeting all come in standard widths, and it is easier to build in a size compatible with these units rather than have to cut the panels down. For example, an eight-foot (2.4 m) house can be made with two 48-inch (120 cm) wide fiberglass panels. Center height depends on the level of the eaves. Low growing plants can take an eave of five feet (1.5 m); tall plants need six or seven feet (1.8 or 2.1 m). After determining eave height, a simple formula will give you the center height: Center height = eave + 0.25 width (a twelve-foot wide (3.6 m) house with a five-foot (1.5 m) eave will have a center height of eight feet (2.4 m).

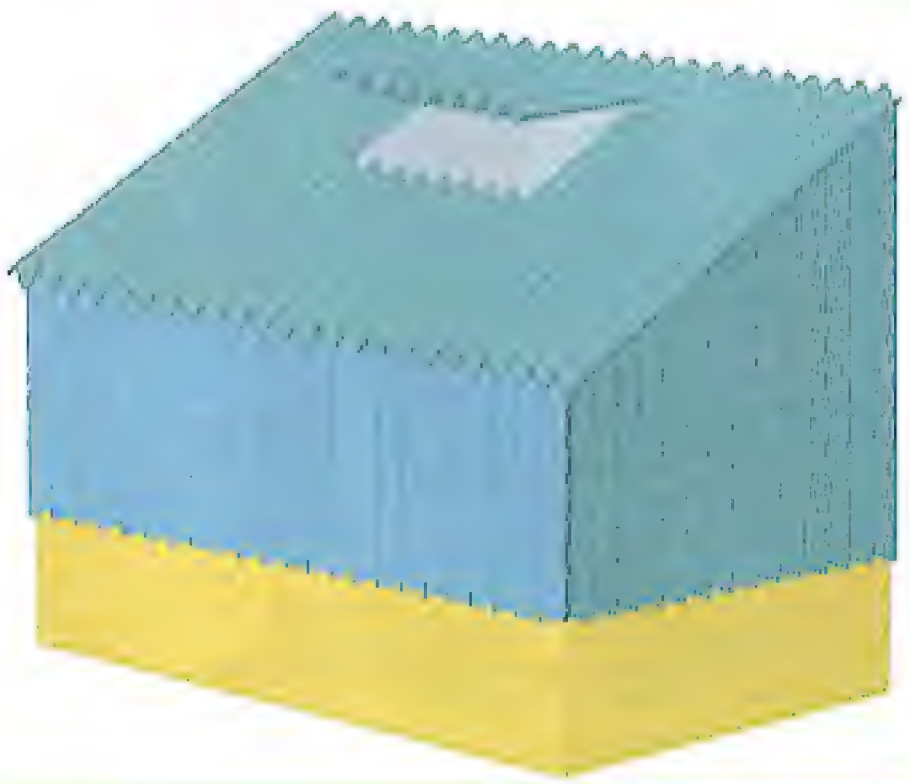
Budget, building skills, and security will weigh heavily in the decision making process. The least expensive structure per square foot (m^2) is an even-span 16-foot (4.8 m) wide that will house two side beds or benches, two walks, and a wide center bed or bench. An 8 to 12 foot (2.4 to 3.6 m) wide lean-to with wide beds or benches and a central walk is the least expensive option overall. Whichever option you choose, building it yourself will be cheaper and more secure than hiring a contractor. You can purchase much of the plumbing and electricity installations in kits or pre-assembled to avoid compromising security. Here is an excellent web site for the do-it-yourselfer: http://www.buildeazy.com/greenhouse.html Or consider a kit: http://www.greenhousekit.com/frame.htm.

Climate will play a role in choosing your greenhouse. For example, a cold frame in the mild Pacific Northwest can give you a six-

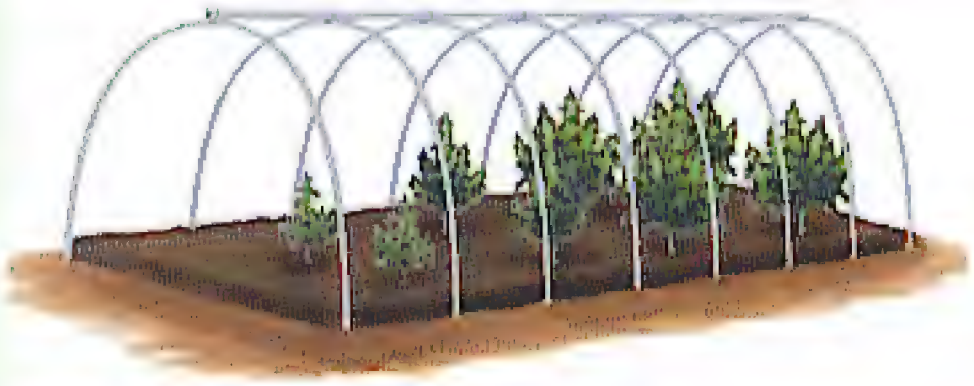
These vegetative clones were transplanted a week earlier and grown out under 24 hours of light before being moved into the flowering room.



This cutaway shows the Styrofoam lining to retain heat. The Styrofoam insulates small containers from cold ground. The top is hinged to give complete access and when raised, it acts as an efficient vent.



This small greenhouse is covered with corrugated fiberglass. A vent on the top is all the ventilation necessary. Enough light penetrates the fiberglass to foster plant growth and keep out of public view.



Hoop houses are very easy to construct from plastic or metal pipe. Some growers use rebar. Arches can easily be made with PVC plastic pipe up to 8 feet (2.4 m) tall. You can also make tunnels hug the ground with a height of less than 3 feet (90 cm).

Black plastic mulch conserves moisture and stops weeds in this hoop house.

This photo was taken in Nijmegen, Netherlands, in late November, 1985, at the original Cannabis Castle started by Neville, owner of the Seed Bank. Plants grow in small squares of rockwool. The white box at right is a heater.

week jump on the growing season. This would not work in a colder region like the upper Midwest. Likewise, a hot or tropical area will require more shade and water. While the large cold frame is the most economical of structures, it will not function as a cold-climate garden. Location and exposure will depend on climate, but in general, you will want the greenhouse to be sheltered from curious eyes and strong winds and to be away from any areas where falling limbs or other debris might be a problem.

There are a number of external design options. Cold frames can be as simple as a window sash laid over a rectangle of straw bales or a piece of plastic stretched over a metal or PVC pipe frame and held in place with clamps. Duct tape also works wonders to keep plastic in place. The advantage to plastic sheeting is that it can be removed during the day to take advantage of fresh air and the sun's warmth and then replaced at night to protect plants from cold air. The cold frame can easily be converted to a hot frame by installing electric heat and a watering/misting system.

Greenhouses can be attached (lean-to, window-mount, even-span) or free-standing. A lean-to uses an existing structure for one or more sides and is limited to single or double-row plant benches with a total width of seven to twelve feet (2.1-3.6 m) and length up to that of the building. Without considering security, the advantages of the lean-to are its proximity to electricity, water, and heat, but on the downside are its limited size, light, ventilation, and temperature control.

A window-mount replaces an existing window providing a relatively low-cost way to grow short plants, small seedlings, or clones. It can be installed fairly simply with common household tools. The disadvantages are its small size and possibly public view.

Low profile greenhouses are perfect for crops of short plants. It is easy to set up a low profile hoop house or a greenhouse

alongside a building that gets full sun. The short greenhouse or cold frame is simple to darken during full summer and lets you reap the benefits of the harvest early!

Small greenhouses and cold frames also work well on patios, balconies, and rooftops. They protect plants from wind and prying eyes of neighbors.

An even-span can be an attractive option. Like the window-mount or lean-to, the even-span is attached to the house and bears similar limitations of size, light, ventilation, and temperature. Unlike the lean-to or window-mount, the even-span can be larger and can open into the house–providing heat and humidity–or even function as a conservatory, an attractive place to relax. It is, however, more expensive to heat and maintain. Such greenhouses are most popular where security is a minimum concern.

The freestanding greenhouse offers the most flexibility in size and location. It can be built to take full advantage of the sun, but it does not retain heat well and can be expensive to keep warm. Many frame types and coverings are available in kits or raw materials. There are also a number of good web sites such as http://www.wvu.edu/~agexten/hortcult/greenhou/building.htm to help you choose the plan that works best for you.

Framing can be in wood or metal. You may select a panel frame which is more expensive to build (panels are individual units) but has the advantage of quick installation and breakdown for storage. If portability is an issue, there are miniature greenhouses and hoop houses which can be purchased as a kit for under $300. These structures, because they can be picked up and moved, are usually considered temporary by municipalities and often do not require permits. For more information on types and prices, visit web sites such as www.hoophouse.com .

The female seedling transplants in this greenhouse have just been watered. Even though they were transplanted late, they still grew out well.

Coverings

Options for coverings are more extensive than those for framing. The traditional greenhouse is glass. Glass, besides compromising security, is heavy, expensive, and easily bro-

Early-flowering crop in a greenhouse shows these ladies touching leaves. They are 3 feet (90 cm) tall.

This backyard greenhouse near Paris, France was recently planted.

Two months after planting, the grower used black plastic to induce flowering with a 12/12 day/night photoperiod.

The long 12-hour nights induce visible signs of flowering in about two weeks. These plants have been flowering for almost a month.

ken. Plastics and fiberglass can provide safe, economical alternatives.

Plastic is much cheaper than glass (a sixth to a tenth of the cost), can be heated as effectively as glass, and is equal to glass in producing quality plants and buds. Polyethylene (PE) is low cost, lightweight, provides ample light, and can withstand fall, winter, and spring weather. It does not tolerate summer UV levels, however, and must be replaced annually. Ultra-violet inhibited PE lasts longer, but both types lose heat more quickly than glass. During the day, this can help keep plants cooler, but at night the heat loss requires the use of an artificial heat source. Poly Weave™ is a plastic fabric made of 8-mil polyethylene reinforced with nylon mesh. It transmits up to 90% sunlight, can be sewn or taped, and has a lifespan of up to five years.

Polyvinyl chloride (PVC) is two to five times more expensive than PE but can last five years or longer. Polyvinylchloride is pliable, transparent or translucent, and comes in four to six foot (1.2-1.8 m) widths which can be sealed together to provide a super-wide piece. Ultraviolet inhibited corrugated plastic panels provide another option. The panels can be used in cold frames, propagation houses, and greenhouses to provide excellent wind and snow protection and optimal solar heat collection. UV inhibited corrugated plastic also has insulating properties (2.5 R insulation/3.5 mm panels, 3.0 R/5.0 mm panels).

Corrugated fiberglass is lightweight, strong, and comes in eight to twelve foot (2.4-3.6 m) panels. Poor grades will discolor, reducing light penetration, but a good grade of clear fiberglass can cost as much or more than glass. Its lower weight is an advantage, and it is more difficult to see through!

Lexan™ http://www.geplastics.com/gelexan/ is a thermoplastic that lasts for years and transmits almost as much light as glass while retaining heat. Clear panels like

those in glass or Lexan™ may require shading during the heat of the day. Again, there are a number of options. You may select a roll-up shade of wood or aluminum, or a shading compound that is painted onto the outside of the glass. Vinyl plastic is a flexible film that installs easily against wet glass inside the structure and is reusable.

Framework and covering are only the beginning. Growing plants in a greenhouse is often more demanding than growing plants indoors. Air temperature, humidity, light, and air quality must all be controlled in relation to a constantly changing greenhouse climate.

Big strong buds are a few weeks from harvest.

Climate Control

Even the best greenhouses will lose heat through radiation, conduction, convection through glass, walls, and floor (or soil), and also through vents, doors, and cracks. To counteract external variables, the internal structure of the greenhouse is, in some ways, more complex than the selection of framing and covering materials.

All greenhouses need ventilation and most need fans. Look for an extraction fan with the capacity to change the air once every minute. Capacity refers to the amount of power needed to circulate the air volume of your structure.

Calculate the volume by multiplying the square footage of your greenhouse by the height. Multiply the volume by sixty air changes per hour to get the cubic feet per minute (cfm) capacity of the greenhouse.

For example a greenhouse with the following:

8 x 12 x 7 feet (2.4 x 3.6 x 2.1 m) greenhouse requires a fan with a cfm of 40,320

8 × 12 × 7 feet × 60 minutes = 40,320

Here is a similar metric example:

2.5 × 3.5 × 2 = 17.5 m^2 × 60 minutes = 1050 m^3

The combination of louvers and fan will force the hottest, most humid air out while protecting the plants from draft. See Chapter Thirteen, "Air," for more information.

Vents control temperatures in all seasons and improve growing conditions. Hand-operated roof vents will require frequent

This good looking 'Mekong Haze' is an outstanding sativa cross.

checks, or you may install automatic vents with an electric motor and thermostat that will respond to conditions around the clock. Venting is important with a cold frame, too. The high-end models have wax-filled vents that operate automatically, opening when the heat rises in the frame and contracting as the temperature cools. You can find the paraffin-filled "Optivent" and many other greenhouse supplies at www.charleysgreenhouse.com.

Heating systems are important to keep plants healthy during cold nights. Cannabis grows well with night temperatures of 60-65°F (16-18°C), but colder nights will require an additional heat source for sustained growth.

You can turn a cold frame into a hot frame by insulating it with manure or heating it with steam, hot water pipes, or electricity. To make the most efficient use of electricity, purchase soil-heating tape or cable, with a thermostat that will automatically control the temperature. Lay the cable on the soil at the bottom of the bed or on a bed of sand or vermiculite and cover with about two inches (5 cm) of sand. You will need to provide 10-15 watts of electric heat for every square foot (30 cm^2) of growing area. Heat cables are also useful in greenhouses for warming seedlings, clones, or flowering plants without the cost of heating the entire structure.

This Swiss clone greenhouse was converted from a greenhouse that grew bedding flowers and vegetables.

Small greenhouses can be heated relatively economically with an electric space heater, or more effectively with thermostatically controlled forced air using ducts or plastic tubing to distribute the heat. Larger units may be heated with forced air or by a coal or natural hot-water or steam system. Steam can also be used to sterilize growing beds and potting soils. Then there is the low-tech method of greenhouse warming: compost. A grower in Portland, Oregon, stacks organic matter on the sides of the greenhouse to a height of about five feet (1.5 m) inside and out. As the compost decomposes, it gives off heat keeping the structure warm at a very low cost.

Evaporative cooling eliminates excess heat and adds humidity, reducing water needs. Moist air circulates through the structure while warm air is expelled through roof vents or exhaust fans. Properly installed, a cooler can reduce the interior temperature as much as 30-40°F (15-23°C) in hot, dry climates, less in wetter areas. As with fans, the size of the cooler is determined by the size of the greenhouse. A general guideline is to find a cooler equal to the total cubic space of the structure plus 50%. To provide both cooling and humidifying effects, the cooler must be installed on the outside of the greenhouse; otherwise, it simply humidifies without dropping the temperature. Turner greenhouses has a handy site (http://www.turnergreenhouses.com/Cooling/cool_tip.html) with some quick tips on selecting a cooling system for your greenhouse. Other great greenhouse sites include: http://www.igcusa.com/greenhousecooling_information.htm for some helpful graphics and http://www.cpjungle.com/nuecool.htm for a detailed explanation of cooling needs and resources.

Misting and watering are also important components of greenhouse gardening.

Extended periods of growing and higher sustained temperatures make adequate water essential. Again, there are methods to suit every temperament from low-tech to automatic.

Most companies offer watering and misting systems by component, which can be mixed and matched to suit the grower's needs. Automatic systems will have a timer that triggers the mist or water at preset intervals. You may want a toggle switch that allows you to rotate between manual and automatic watering. For more information on specific uses and types of watering systems, go to a website such as www.cloudtops.com which covers a variety of topics pertaining to the internal greenhouse environment.

A lower-tech method of mist and watering control consists of a series of screens that tilt downward with the weight of the water shutting off the flow then raising to restart the cycle as the screens dry. It is fully automated by the weight of the water or lack thereof. Of course, there is also hand-watering which is very effective and requires no mechanical intervention. Automatic systems, both high and low-tech, are alternatives to hand-watering that can be most helpful during a gardener's absence.

Heating and watering devices depend on that other cost of greenhouse keeping: how much time the grower has to spend tending plants. You can keep equipment costs to a minimum if you plan to spend a lot of time in the greenhouse. For growers who are away from the structure for long periods, automatic systems are a good investment.

In addition to shelter, heat, water, and ventilation, plants need light. This section will offer a brief treatment of lighting, since it is covered in greater depth in Chapter Nine. Fluorescent light offers higher efficiency with low heat and is the most widely used. Incandescent light–60-500 watts–may be used to extend day-length. High-intensity

Over the last decade, the soil in this Spanish glasshouse has been regularly amended with organic matter. The growers put lightweight hydroclay on soil surface as mulch that does not decompose.

This beautiful greenhouse was grown by the legendary Shantibaba in Switzerland. After an extended stint in Swiss prison, he is free!

Greenhouse buds in all directions!

discharge (HID) offers long life, and the sodium lamps emit the best light to be combined with natural sunlight. Regardless of light source selected, you may want to purchase a light meter ($30-50). It will be very useful in setting the light level in your greenhouse for maximum efficiency.

Carbon Dioxide (CO_2) is another important aspect of the greenhouse environment that will be only touched upon in this section. Closed greenhouses often have too little CO_2 during the day for plants to be able to use light effectively. Enhancing the levels of CO_2 will accelerate plant growth; methods for doing so range from expensive CO_2 equipment with infrared sensors to block dry ice kept in a pressure bottle until needed. More detailed information on CO_2 can be found in Chapter Thirteen, "Air."

Security is always a concern when growing cannabis. There are several ways to camouflage the greenhouse such as growing other plants with the cannabis. Paint the walls with sun-blocking paint so light still enters but prying eyes do not. Go to the discount store and purchase artificial flowers. Put the artificial flowers on and around the cannabis plants so it looks like they are growing from the cannabis. Remember to pay attention to other plants that could be blooming during this time and follow suit.

Planting in the earth floor of the green-

Growing greenhouse seedlings in containers for the first month saves space and gets them ready to flower. Transplanting with a minimum of plant stress is the key to this move!

house allows you to use organic methods. The plants cannot be moved easily, but they grow bigger and require less maintenance than container-grown plants. Without containers, plants also retain a lower profile. Growing in Mother Earth is always better than planting in pots! Most all the principles that apply to outdoor growing apply to growing in a greenhouse, too. Check out Chapter Seven, "Outdoors" and Chapter Ten, "Soil" and "Containers" for more information.

This Swiss grower moves the covering over plants in the afternoon and opens it after dark. The coverings slide over smooth wires strung between wooden posts.

Greenhouses can be darkened to induce flowering during mid summer. This practice will allow you to harvest up to three crops a year! Cannabis plants flower when nights are long (12 hours) and days are short (12 hours). Darken the greenhouse so that plants receive 12 hours of uninterrupted darkness every day to induce flowering. When the greenhouse is darkened daily so that plants receive 12 hours of darkness, a crop of clones planted May 1st can be harvested by the middle of July.

Automatic darkening machinery is available for large commercial greenhouses. Smaller greenhouses are normally covered with black plastic to "black out" the interior for 12 hours.

When combined with natural sunlight, artificial light is optimally used during non-daylight hours. Greenhouse growers turn the HID lights on when sunlight diminishes (30 minutes before sunset) and off when sunlight strengthens (30 minutes after sunrise). Turn on the HID when the daylight intensity is less than two times the intensity of the HID. Measure this point with a light meter. Turn off the HID when the daylight intensity is greater than two times the intensity of the HID. A simple photocell that measures light intensity can be used to turn the lights on and off automatically.

Supplementary lighting has greatest effect when applied to the youngest plants. It is least expensive to light plants when they are small.

Many different types of coverings are available for greenhouses and cold frames. The best greenhouse films are UV (ultraviolet) resistant and still transmit plenty of light. Lexan is rigid and full of thermo-storing channels. It is one of the best greenhouse plastics available. Lexan lasts for years and transmits almost as much light as glass while retaining greenhouse heat. The only problem with Lexan is that it is clear! Some growers disguise greenhouse cannabis by wiring ornamental plastic flowers to the branches visible to passers by, which is advisable where neighbors are not curious and laws lax.

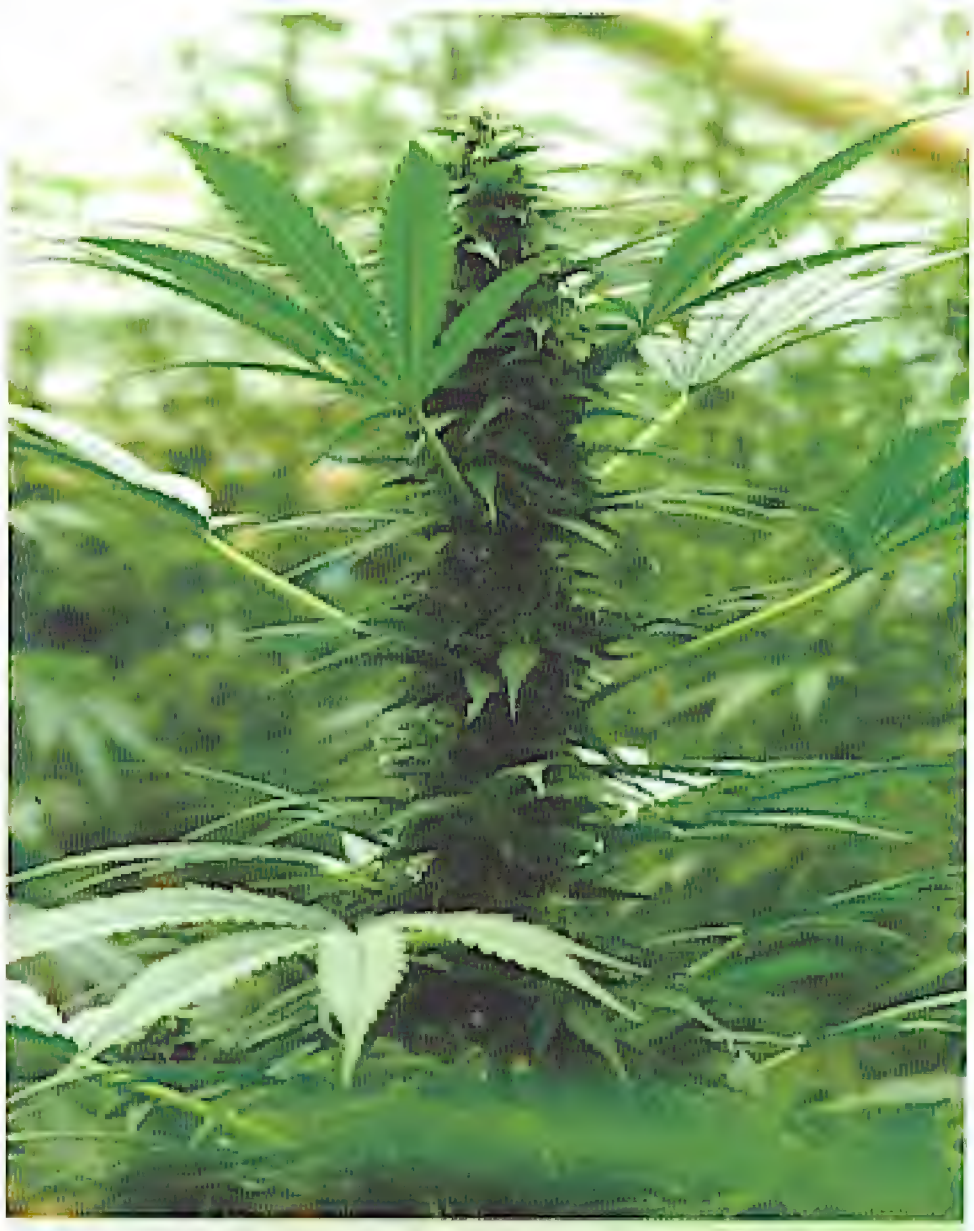
Regulating heat in a greenhouse is much more difficult than in an enclosed grow room. Greenhouses heat up quickly on sunny days and cool equally fast when the sun ducks behind a cloud or drops below

Automatic greenhouse darkening system in a greenhouse at the Cannabis Castle in the Netherlands "blacks out" gardens to induce flowering. The covering also serves to insulate the greenhouse during the short days of winter.

the horizon. This fluctuation in heat is difficult and expensive to control. Hot and cold dips also affect the ratio of nutrient to water plants need and use, which makes growing in a greenhouse more demanding than growing indoors.

Adding a complete greenhouse chapter here is beyond the scope of this book. A couple of my favorite books on greenhouse growing include *Gardening Under Cover*, by William Head, Sasquatch Books, $16.95, and *Gardening in Your Greenhouse*, by Mark Freeman, Stackpole Books, $18.95.

Keep the lights on at night if days are short in the winter or if you live in a tropical climate. These South American growers use incandescent light to prevent plants from flowering when days are short.



Good looking bud matures in light filtered through Agrolene greenhouse covering.

Chapter SEVEN
OUTDOORS

Gregorio (Goyo), cannabis photographer and writer demonstrates a field of flowering females in Switzerland.

Peek-a-boo! This beautiful 'Jamaican Pearl' was planted in an obscure corner of the back yard.

The grower is peeking through this plant in his guerilla patch.

Introduction

Much of the information that pertains specifically to outdoor cultivation is in this chapter. Many of the subjects within this chapter are covered in great detail in other chapters of the book. References to these chapters are made in the appropriate places.

Outdoor growing is more popular than indoor growing in countries with lax cannabis laws. The reason is simple–sunshine is free; lights and electricity cost money. More people grow outdoors than indoors for this simple reason.

Cannabis is a strong plant that can be grown successfully almost anywhere. As long as you pay attention to security, virtually any growing area can be altered enough, often with little effort, to grow a healthy crop.

Do your research before planting. Read garden columns and talk to local growers about the best time to plant and grow tomatoes or similar vegetables, then plan accordingly. Also inquire about common pests and insects. Collect publications on local growing conditions. These are often available at nurseries or through your local department or ministry of agriculture.

You can grow anywhere. For example, one of the first guerilla crops I planted was on a freeway on-ramp in a city in the Northwest U.S. in the 1970s. I planted seedlings in a clay soil in a blackberry infested environment in late June. I gave the plants a single application of time release fertilizer. By late September there were short little female plants with dense little buds to smoke. The harvest weighed in at just under a pound of fragrant but leafy little buds. Everybody called it "homegrown."

· My first big guerilla crop was planted and harvested in the California foothills. I hiked up one of the many canyons carrying a 3.5 hp engine that weighed 30 pounds, (14 kg) plus the pump (another 30 pounds) and the plumbing connections that made it attach to a 2-inch (5 cm) inlet and a 1.5-inch (3.5 cm) outlet. Schlepping four, 30-gallon (115 L) plastic garbage cans to act as reservoirs, 10-foot (3 m) lengths of PVC pipe,

and 200 feet (60 m) of hose was a challenge!

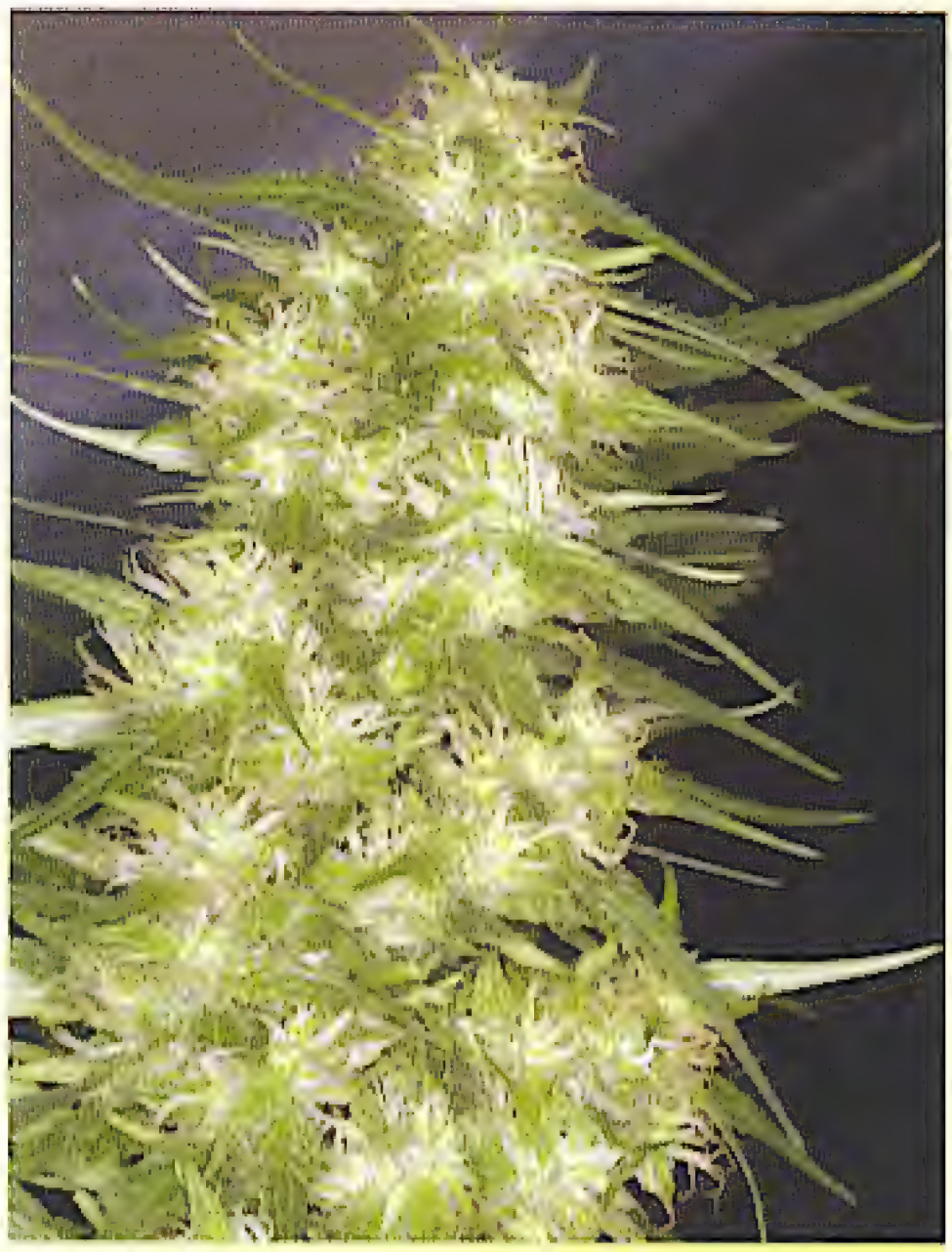
I made these trips carrying conspicuous supplies at four in the morning. The hard part was carrying it all back down when I closed down the grow show!

After many trips up the canyon, I harvested six pounds of Colombian and Mexican bud. The quality was fair, but I harvested early and had the only fresh buds in town in mid-September.

In "the good old days," rural real estate for sale in northern California often advertised the number of marijuana growing holes that had already been amended.

Now Park Rangers carry guns and have the authority to arrest "suspected" growers. Latin mafias have also moved into the National Forests installing illegal immigrants with guns to grow and defend large patches of guerilla grass. The War on Drugs has turned much of America into an unsafe place to live and grow.

Australia, Canada, much of Europe, and many other parts of the world are significantly different; growers can plant in their backyards, greenhouses, or in remote locations with little fear of arrest.



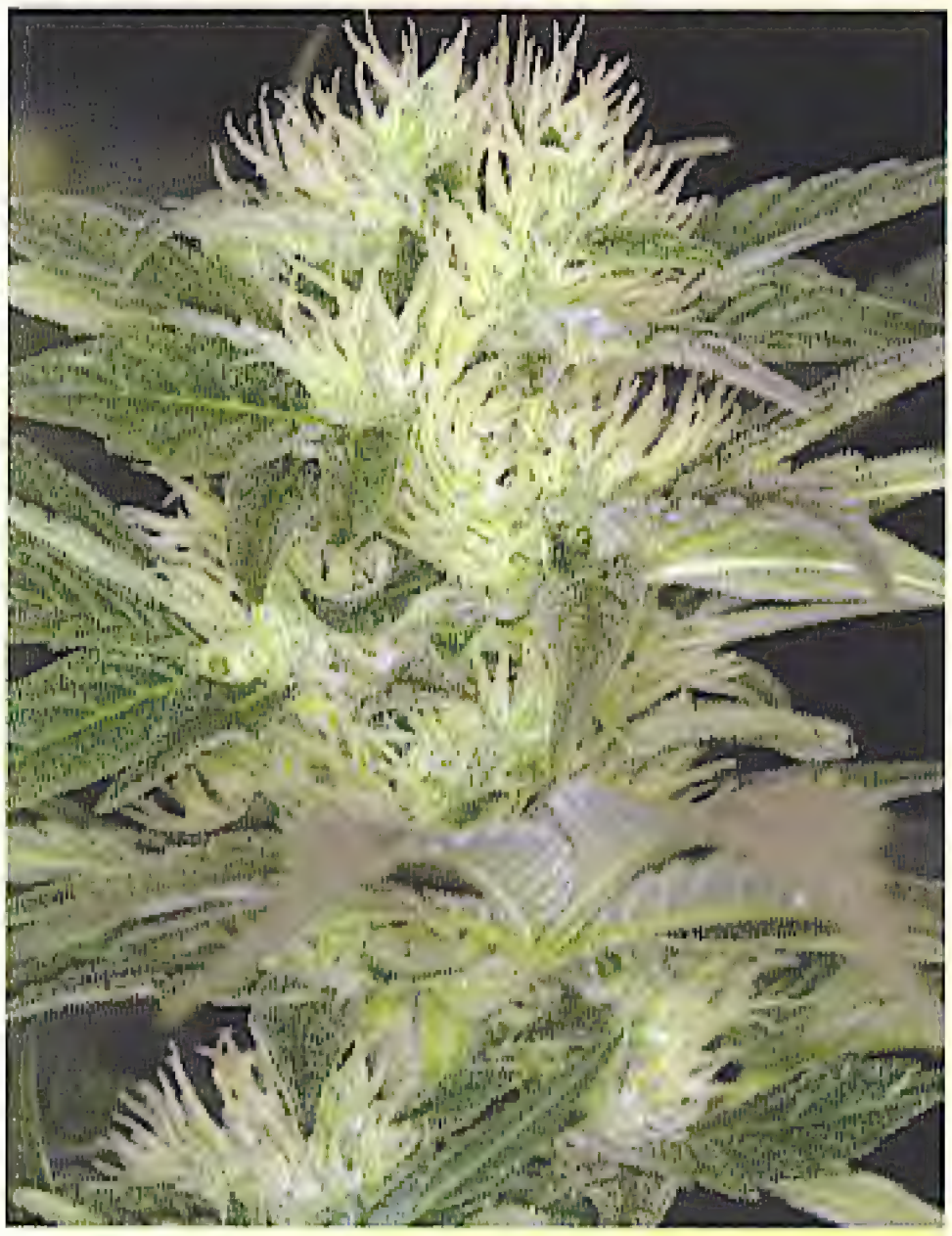
Cannabis strains mature at different times. Choose strains that grow well in your climate and that ripen before days grow cold and wet.

Strains

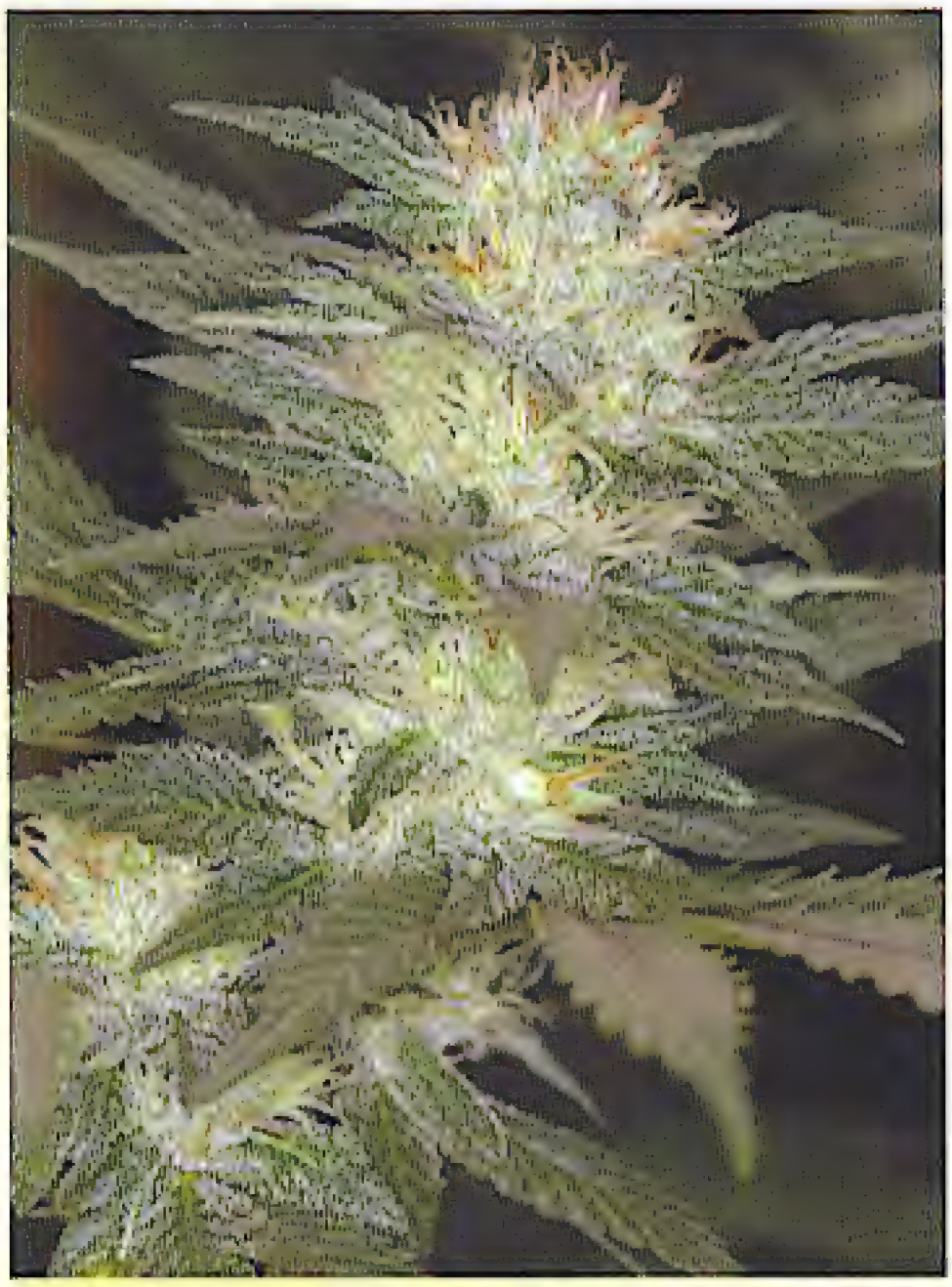
Selecting the right strains for your climate is just as important as finding the perfect location. This section on strains is adapted from a thread started by Leaf, a member of www.overgrow.com and an expert outdoor grower with tons of experience. One of the Case Studies is also adapted from posts by Leaf. Much more information is also available on the site.

This is a quick rundown on some popular outdoor strains. The strains are grouped in five different categories distinguished by their finishing times. For more information on strains, hit the "StrainGuide" on www.overgrow.com.

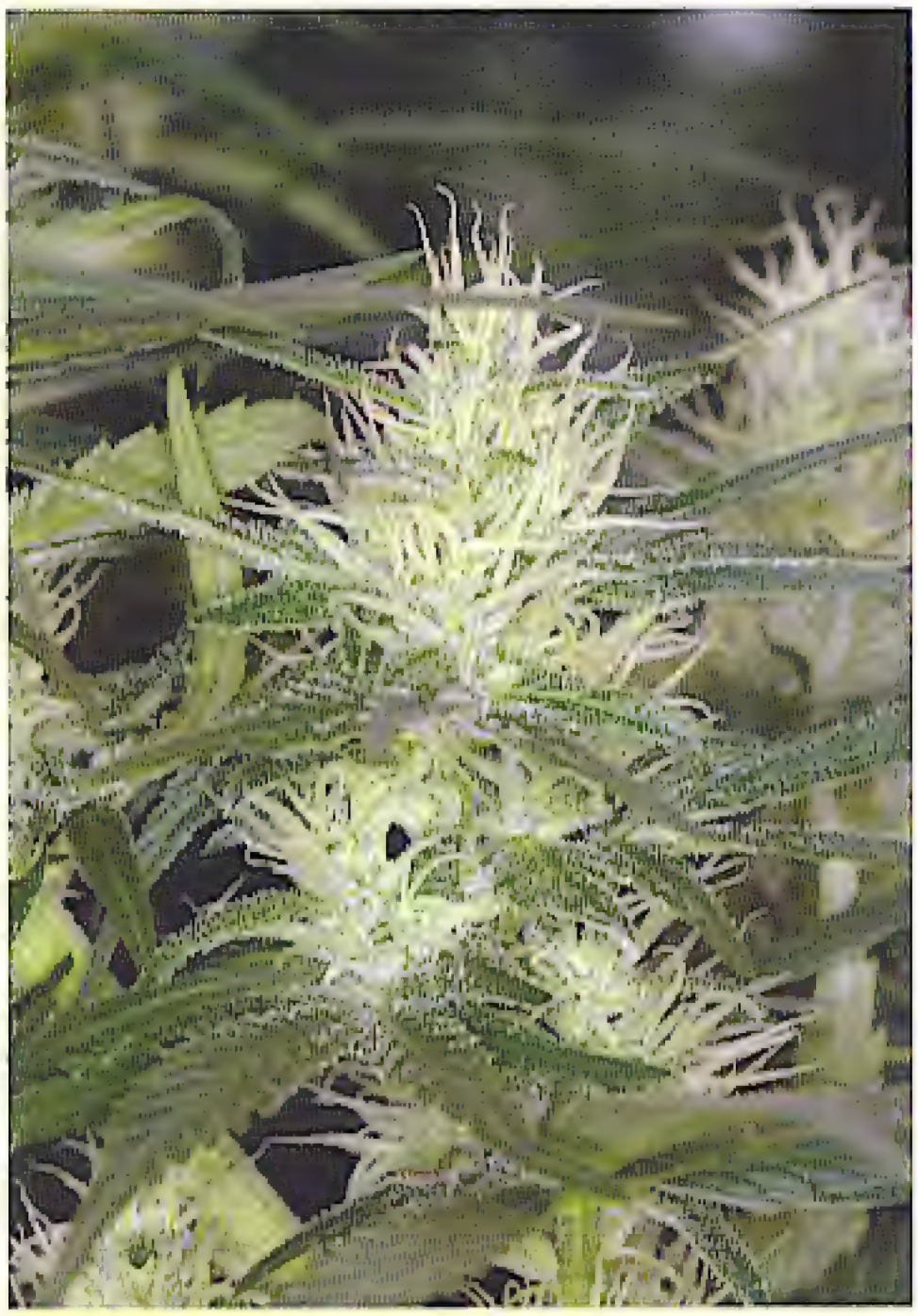
It is a good idea to grow several different strains with different finishing times to spread out the work and drying over the course of time. If you grow a spring crop, you can harvest much of the season.



'Hash Plant', available from many seed companies, is ready to harvest in late August when grown outdoors.



'Early Riser', true to its name, is ready to harvest from late August to mid-September.



'Jack Herer' finishes from mid- to late-September.

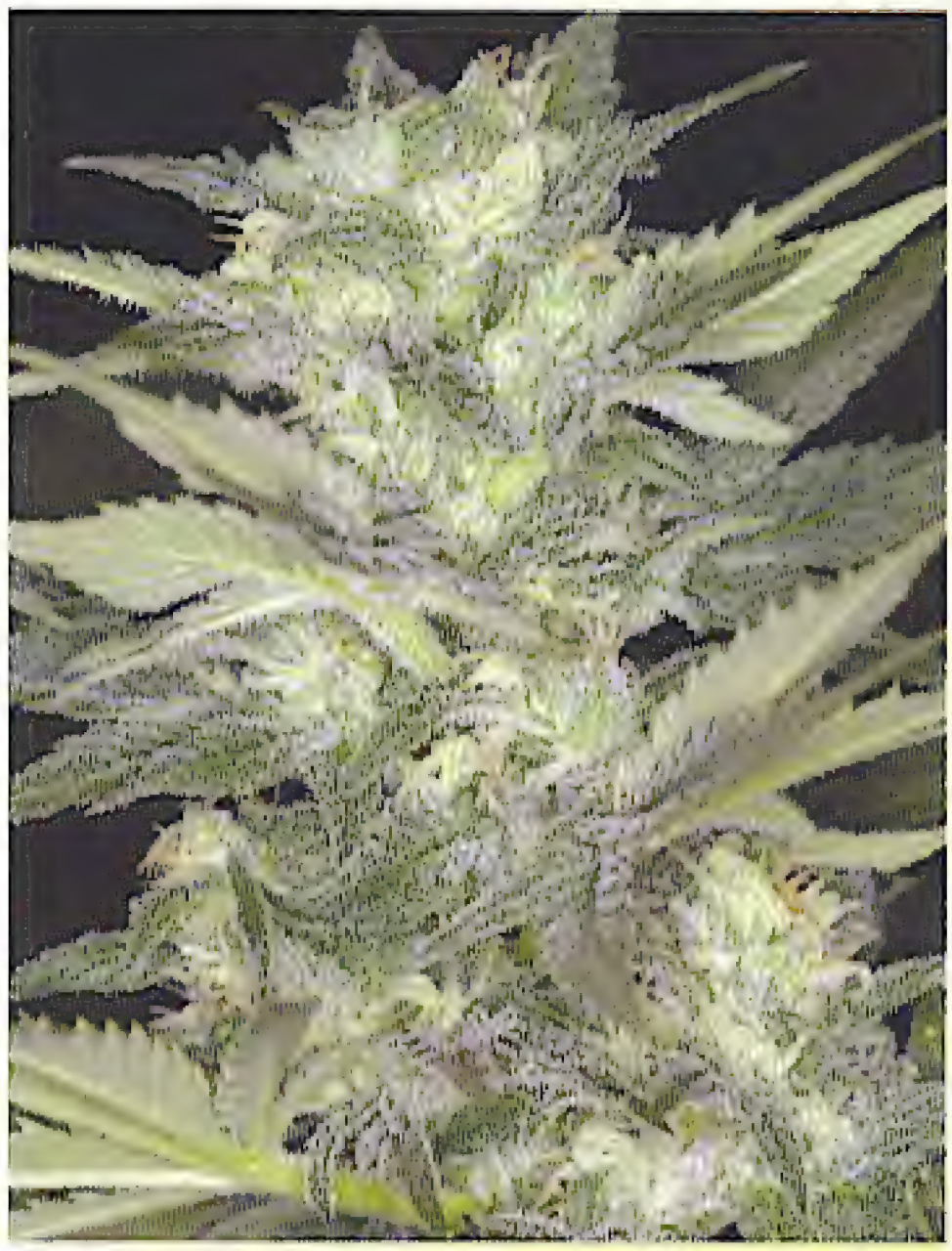
1. 'Hash Plant', 'Afghani', 'Hindu Kush', etc., are great varieties that finish mid- to late-August. The yield and potency are quite high, but the fragrance is high, too! These strains are for experienced growers. They need lots of intense sunlight and must be watered from below, not from above with rain. These varieties start to bud when the days are long and the sunlight is intense. The buds fatten up quickly on plants with a short, squat growth habit. Rain followed by hot sunny days can foster mold, which could decimate the crop in a short time. Leaf has seen dried, cured buds the size of softballs that were packed with mold. They were thrown away. To avoid mold problems, he suggests harvesting when about 10 percent of the pistils have died back. Even heavy dew can cause a moldy disaster! Leaf loves 'Hash Plant'.
2. 'Early Pearl', 'Early Queen', 'Early Riser', etc., 'Manitoba Poison', and similar strains finish from late-August to early-September at latitude 49° north. They are potent and yield a little better than the plants listed above. They grow from six to nine feet (1.8-2.7 m) tall and are quite bushy. Most of these strains are mold resistant and easy to grow–excellent choices for novices or growers with little time to look after their plants.
3. 'Mighty Mite', 'Durban Poison', 'Jack Herer', etc., finish mid- to late-September. The yield and potency are very good, and the odor is not too intense. All the plants grow a huge, dominant main cola with several large terminal buds on main branches. They may need trellising to avoid broken branches. Topping appears to increase yield. These strains are fairly low-maintenance, but the more love you give, the more they return. These plants grow well if left alone until mid-September and have a good harvest as long as they do not dry out or fall over. 'Mighty Mite' is another favorite.
4. 'Blueberry', 'White Widow', 'White Rhino', 'Super Silver Haze', 'Pure Power Plant', etc., tend to finish mid- to late-October. Yields and

potency are very high! They do not smell a lot while growing, but that changes when they are cut! They grow seven- to ten-feet (2-3 m) tall and yield heavily. They require some attention to get the best crop. 'Super Silver Haze' and 'Pure Power Plant' can be a bitch to grow because they often develop mold near harvest when the weather is damp. However, a mild to moderate frost tends to bring out some nice (purple) colors. They all do well outdoors but grow even better indoors.

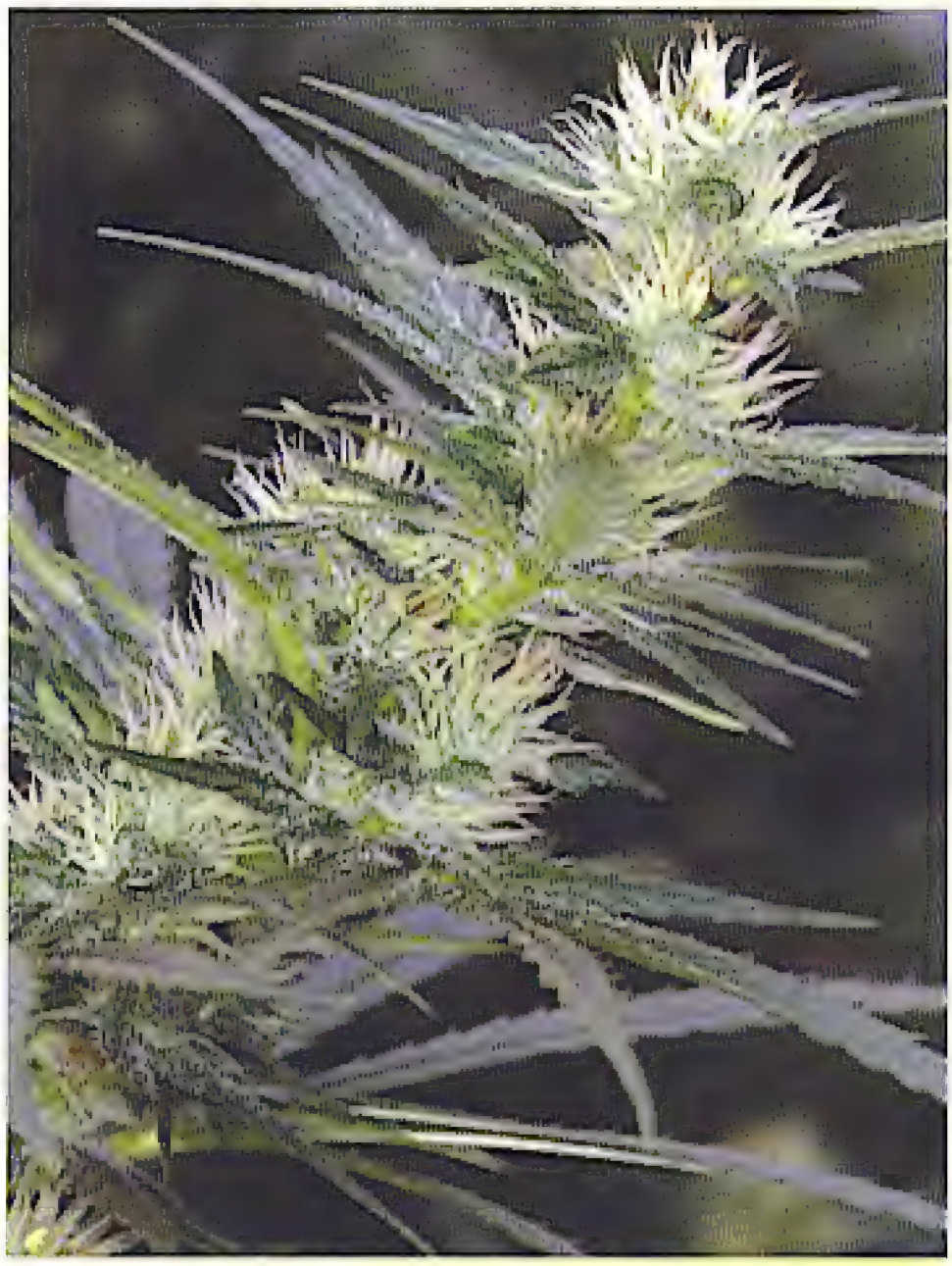
5. 'Skunk #1', 'Northern Lights #5', 'Big Bud', and pure or nearly pure *sativas* finish from late-October to early-November. Sometimes *sativas* do not finish if the weather cools too much and snow comes. One year, on November 15th, the first snowfall had to be shaken off at harvest! About 50 percent of the pistils had died back. 'Skunk #1' is extremely smelly; the wind can literally carry the skunk scent for a mile. All of the plants in this group have a large to huge yield capable of producing several pounds each. 'Big Bud' yields an enormous amount; the bottom branches must be tied or staked to avoid breaking from bud weight. Potency is superb in all plants in this category except for 'Big Bud.'

All plants grow tall. 'Big Bud' and 'Skunk #1' grow 10-14 feet (3-4 m) tall. 'Northern Lights' are often taller! A few *sativas* can grow to 20 feet (6 m)!

Fungus can become a problem with these late-flowering plants. They withstand rain and light frost well; many can take a few light snowfalls. After all, they grow like weeds!



'White Russian' and others from the "White" family are ready to harvest from mid- to late-October.

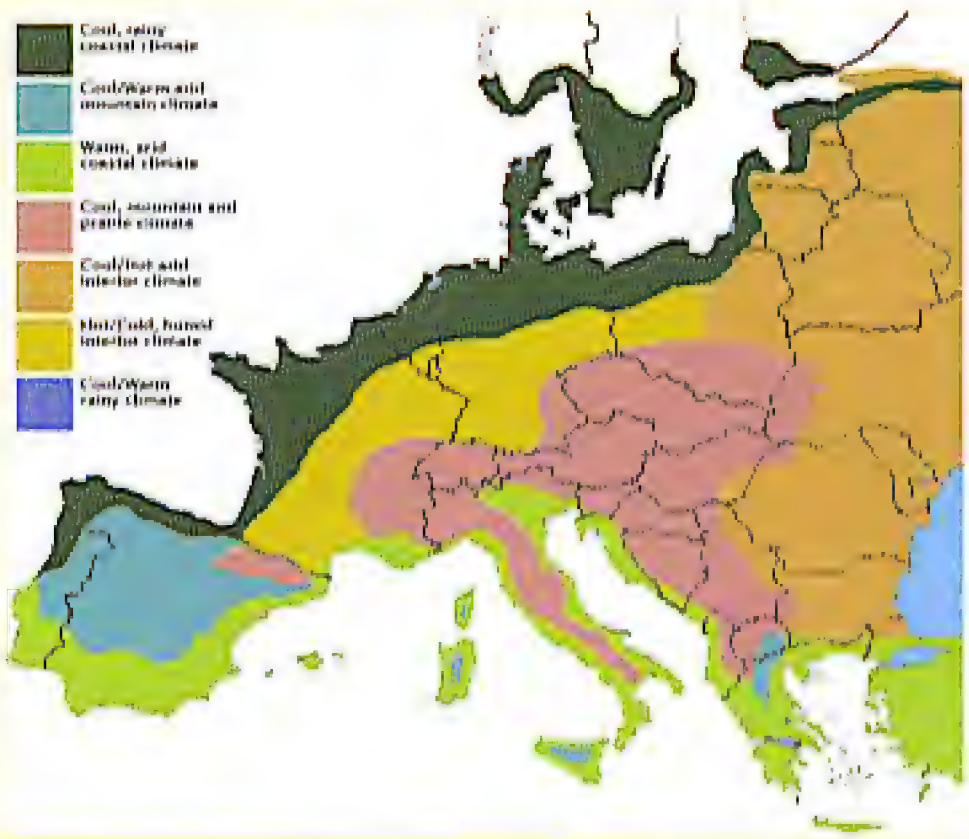


'Northern Lights #5 x Haze' is one of the most potent and tasty strains. This cross is ready to harvest from late-October through early-November.

Climate

Outdoor grow shows are dominated by climate, soil, and water supply whether you are planting in a remote mountain patch, a cozy garden in your backyard, or on your balcony.

Microclimates are mini climates that exist within larger climates. Maps are available of these areas. Many maps such as the United States Department of Agriculture (USDA) Hardiness Zone map, www.usna.usda.gov/



ABOVE: Rough climate map of Europe.
BELOW: Rough climate map of North America. The legend is the same in both illustrations.

Flanked by a fig tree, this flowering female was grown in Ticino, the "Banana Belt," of Switzerland.

Hardzone/ushzmap.html, detail limited climatic boundaries. The map divides North America into ten zones plus zone 11 to represent areas that have average annual minimum temperatures above 40°F (4.4°C) and are frost free. Look into detailed microclimate maps for your grow zone. One of the most detailed climate maps can be found in Sunset's *Western Garden Book*, Sunset Publishing. The map details 26 distinct climate zones in 13 Western States and British Colombia and Alberta, Canada. This is the best climatic map available for the area.

Europe and other countries have much climatic information available via the Internet. Check out rainfall, temperature, and humidity charts for virtually all large cities in the world and most geographic regions. Visit www.weather.com for specific information on your local weather.

Temperature, rainfall, and sunlight vary widely across the globe, providing unique growing environments and countless microclimates. Look for specific information for your climate at local nurseries and in regional gardening books and magazines or through the department of agriculture (County Extension Agents) in your area. Here is a brief rundown on the qualities of different climates.

Coastal climates like those found in the Northwestern United States, British Columbia, Canada, Northern Coastal Europe, and the United Kingdom, etc., are cool and rainy. Annual rainfall most often exceeds 40 inches (103 liters per m^3) and can be as high as 100 inches (253 per m^3)! Winter blows in early in these areas bringing a chilling rain and low light levels. The more northern zones experience shorter days and wet cold weather earlier than the southern zones. Growing outdoors here is challenging because the temperature seldom drops below freezing, which contributes to larger insect populations. Some of these cold coastal rainforests are packed with lush but invasive foliage and fungal growth brought on by the cold and damp.

Clay soil with a low pH is common in moist coastal zones. See "Clay Soil" below for more information.

Start Clones or Seedlings Indoors

Get a jump on the season by starting clones and seedlings under lights indoors. Move small containerized plants into heated greenhouses to start hardening-off. Transplant to a backyard or secure guerilla patch once they have become hardened-off and are more resistant to environmental stress.

Beat the cold; start seedlings and cuttings indoors and move them into a heated greenhouse in March or April. A 400-watt HP sodium lamp on a timer can augment the less-intense natural light of early spring. Seedlings and clones will need at least 14 hours of artificial and natural light per day until plants are transplanted outdoors.

Alpine mountain climates are cold much of the year. Freezing temperatures, mineral-heavy acidic soil, and wind top the list of grower concerns.

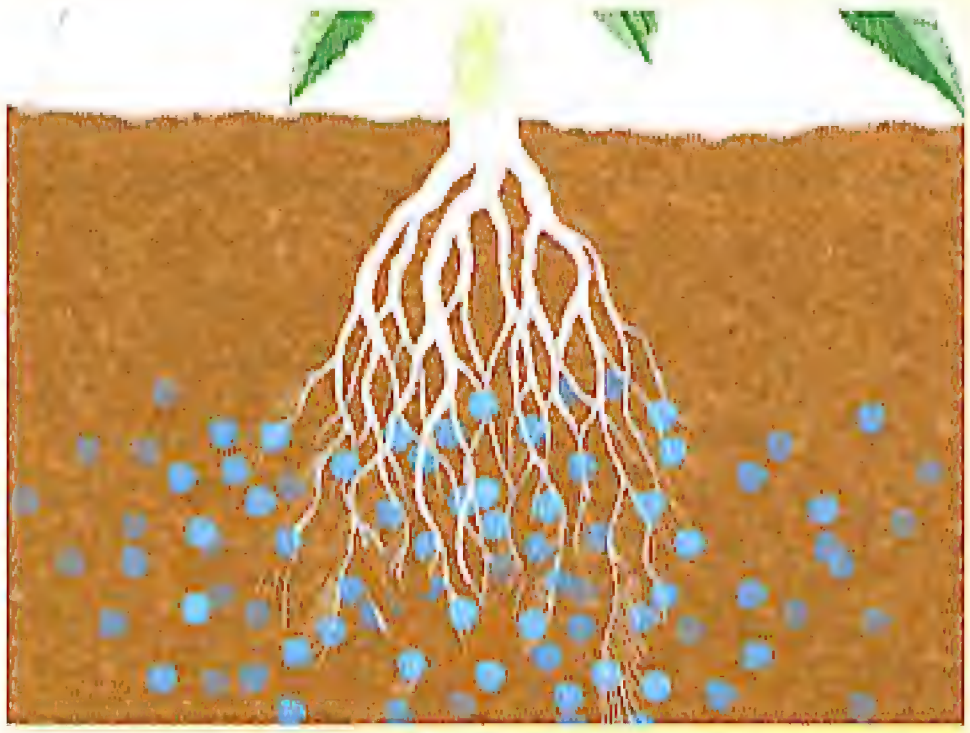
Summer temperatures in the mountains can dip to 30°F (-1°C) or lower in the summer, at as low as 2000 feet (610 m) elevation. Temperatures below 50°F (10°C) virtually stop growth, and temperatures below 40°F (5°C) can cause foliage tissue damage in many strains. Low temperatures cause stress in plants and a reduction in harvest weight. On the other hand, plants in high alpine climates tend to produce more resin and 10-20 percent more THC than those in lower gardens.

Most alpine soils lack humus, and strong winds will dry out the plants. For best results, look for patches where pasture grass grows.

You can help your plants deal with mountain stress by backfilling planting holes with a mix of peat moss, soil, polymer crystals, and slow-acting layers of organic fertilizer.

Cold wind causes moisture loss, and plants dry out quickly. This causes stress which can weaken plants and leave them open to attack by disease and insects.

Guerilla-grown buds suffer many days of wind, rain, hot sun, and cool nights. Such stressful conditions often impair resin production.



Polymer crystals mixed in the soil absorb water and release it over time.

Cool mountain environments, like those in Switzerland or the Rocky Mountains of North America, usually experience first frost in September and last frost during May.

Spring and fall months are rainy with a dry period in July and August. Cold rains in the fall can cause mold. Planting early-maturing strains helps avoid weather problems.

Rain and wind coupled with heavy buds broke this plant. Tied together with nylon rope, buds were supplied with enough fluids to produce a healthy harvest.

Tropical climates are generally warm to hot and humid. Rainy and dry seasons vary by location. Most jungle and tropical climates have daily rains. Protecting flowering females from rain with a greenhouse will help avoid bud mold and other problems. The closer to the equator, the less deviation there is between the length of days and nights. Extra hours of artificial light are necessary to keep plants in the vegetative growth stage. Tropical *sativa* strains are often favored in these regions because they are acclimated and require little special care.

Nighttime temperatures and humidity are often high. In fact, extended nighttime temperatures above 85°F (28°C) will cause plants to stop growing. Nighttime cooling could be necessary to keep plants growing well.

Soil

Soil is of three main types and all shades of gray and brown in between. Soil is the product of millions of years of geology.

Clay soil, also known as "heavy soil" or "adobe" in North America, is common in coastal areas and is very widespread inland. It is difficult to work with.

Clay soils hold water well and provide slow, even drainage. Clay soils are slow to warm in the spring, but hold warmth well into autumn when sunlight is fading. The density of clay does not allow for proper air circulation, and root growth is inhibited. For more information on clay soil, see Chapter Ten, "Soil."

Prepare clay soil at least a month before planting, adding lots of compost and manure. Clay soils can hold water too well, which can smother roots. Adding organic matter will "lighten" the heavy soil, thus creating air pockets, improving drainage, and promoting root growth.

The month delay gives the manure a chance to "cool" so it won't burn the plants.

Use low sodium manure that contains few salts. Cows are given sodium nitrate to make them gain weight, but that same salt in their manure can lock up nutrients available to the plants, stunting their growth.

Do not be fooled by anyone who suggests adding sand to break up clay soil. Sand and clay create cement; add straw to make bricks!

One gardener had a backhoe operator excavate a pit 10 feet square by 2 feet (3 m × 60 cm) deep, built a 2-foot (60 cm) retaining wall around it, then filled it in with 400 cubic yards of river loam. This expensive, laborious soil transformation paid off in one outstanding crop after another over the years.

A long-term option is to annually till in compost, manure, and other organic amendments.

Raised beds (covered below) are an excellent option for clay soil. Till the clay when it is damp and workable, and add manure/compost in heaps; plant directly in the mounds.

Pile subsoil in a ring around the plant, making a bowl to catch rain water.

Sandy soil is found near large bodies of water, in deserts, and in many inland areas. It is comprised of small, medium, and large particles and is easy to till even when wet. Plants can achieve excellent root penetration. Sandy soil feels and looks gritty.

Sand is easy to work and warms quickly in the spring, but it does not hold fertilizer well, especially when over-watered–the nutrients wash out. Compost helps bind the large particles providing food and air circulation, but in hot climates the organic matter decomposes rapidly and is soon consumed by bacteria and other soil organisms.

For best results keep sandy soil cool, retain moisture with mulch, and cultivate often, adding additional compost. Winter season cover crops will hold moisture and prevent runoff while retaining life in the soil.

Once you have amended soil so it holds plenty of water and nutrients but still drains well, you can take it easy.

Loam soil has all the advantages of clay and sand; it holds moisture and water like clay but is quick to warm and has good drainage and a work-friendly structure like sand. It is the perfect growing medium.

Most soils are a combination of sand and clay. Silty loam falls in between and feels almost greasy when rubbed in your hand, though it is less slippery than clay. The ultimate soil for growing plants is loam found in ancient river bottoms and lake beds where sedimentary soil builds up. It is dark, fertile, and crumbly in the hand.

Forest soils vary greatly in pH and fertility. The needles and deadfall from the trees usually make the soil acidic.

Most of the forests remaining in North America and Europe are on hillsides. Flat land is used for farming, recreation, and urban sprawl.

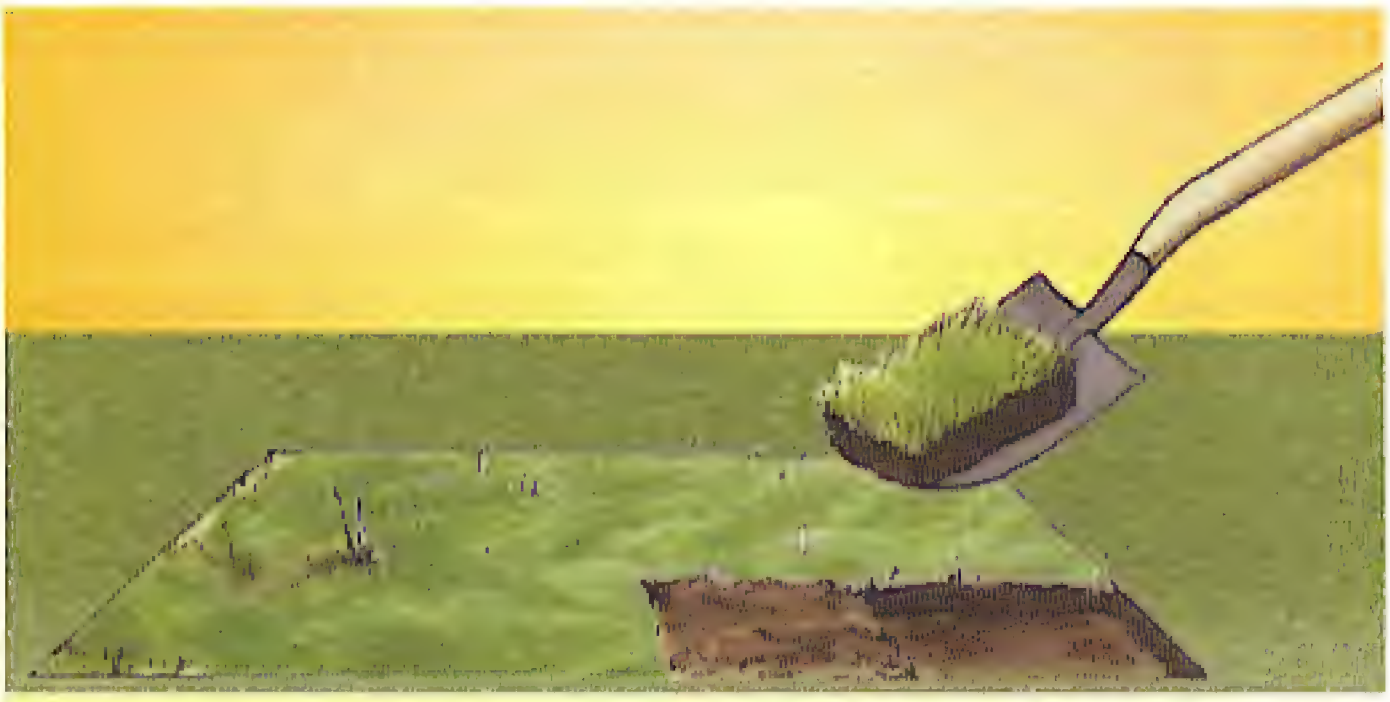
Long-needle pines grow in poor soils such as those found in mountainous and tropical regions. They have deep roots to look for all the elements in the soil. When a layer of humus evolves, short-needle conifers dominate. The roots on these trees spread out on the surface to search for nourishment and bury roots to anchor it in place.

Jungles are usually low-growing, hot, moist, and dense. The soil is shallow and alive. The hot weather makes all foliage that falls to the ground decompose quickly. Often nutrients are available to plants, but the soil does not have a chance to build density. Layers of tropical soils can be very thin. However, through much of Mexico and Central America volcanic eruptions brought much rock and minerals to the surface. Mountain valleys and lowlands are full of alluvial plains that are packed with nutrient-rich soil.

Grasslands often have wonderful soil that recycles nutrients. Sunshine is likely to be good, but detection could be a problem in wide-open spaces. Plant in areas that are protected from wind and curious eyes.

Mountain soils are often very rich in minerals but lack humus. Alpine valleys hold the best alluvial-plain soil that is the product of volcanic rock erosion. Hillsides are generally less fertile, and soil must be amended to grow a good crop.

Bog soils are moist and spongy. Bogs are filled with vegetation and often have very rich soil. They present a perfect place to grow individual plants. Cut a square yard (90 cm^2) of moist sod from the ground, turn it over, and plant. Marsh ground supplies sufficient water on its own. Add a bit of time-release fertilizer during



Turn over the top layer of grass to prepare moist soils for planting.

transplanting and another handful of "flowering" formula during a check-up in early August.

Most often, it is easiest to change or amend native soil that will produce scrawny plants. You can grow in containers so you can control all factors, but just remember, containers require more maintenance. See "Terrace Growing" for more information.

Amendments improve soil, root penetration, soil water retention, etc. See Chapter Ten, "Soil," for a complete discussion of amendments.

Maintain a compost pile. See "Compost" in Chapter Ten for more information.

Worms work wonders with soil. Grow your own crop of worms in a worm bin. Worms grow and reproduce in layers of food scraps, soil, and manure. They produce worm castings, an excellent fertilizer/amendment or compost tea ingredient. For more information about worms, check out the classic book, *Worms Eat My Garbage: How to Set Up & Maintain a Worm Composting System*, by Mary Appelhof, Flower Press.

Soil and water pH levels are exceptionally important. Cannabis does best with a soil pH of about 6.5. Soil pH is easy to change. See Chapter Ten for a complete discussion of pH.

Lime amendments will raise pH and lower acidity, but too much lime can burn roots and make nutrients unavailable. If you need more than one full point of pH adjustment, check with local farmers, nurseries, or agricultural agencies for recommendations on lime application.

Lime application differs based on soil type. Some guidelines are:

35 pounds/300 square yards (16 kg/251 m^2) very sandy soil

50 pounds/300 square yards (23 kg/251 m^2) sandy soil

70 pounds 300 square yards (32 kg/251 m^2) loam

80 pounds/ 300 square yards (36 kg/251 m^2) heavy clay soil

*1 cubic yard = 27 cubic feet (1 m^3 = 106 cm^3) (1 cubic yard = 105 cm^3)

* rule of thumb: add 1-2 pounds (0.5-0.9 kg) of dolomite lime to each cubic foot (0.03 cm^3) of soil

Raising alkaline levels is somewhat easier than raising the acid level. If your soil is too alkaline, 1.2 oz (34 gm) of finely ground rock sulfur per square yard (90 cm^2) of sandy soil will reduce soil pH by one point. Other types of soil will need 3.6 oz (100 gm) per square yard (90 cm^2). Well-decomposed sawdust, composted leaves, and peat moss also help to acidify soil and lower pH.

Hardpan

Hardpan is a condition whereby a layer of soil beneath the soil surface is hard and impermeable to both water and roots. Caliche is a hardpan common in the southwest USA. It consists of a layer of calcium carbonate (lime) located below the topsoil. The texture of caliche varies from granular to solid cement-like rock and can be from a few inches to many feet thick.

To plant in any hardpan area, you must bore through it to provide drainage. An auger will work to bore a hole, but a pick and shovel are practical, too. All other planting techniques remain the same. Discard the hardpan bored out of the hole and replace with compost or high-quality garden soil.

Prepare Soil

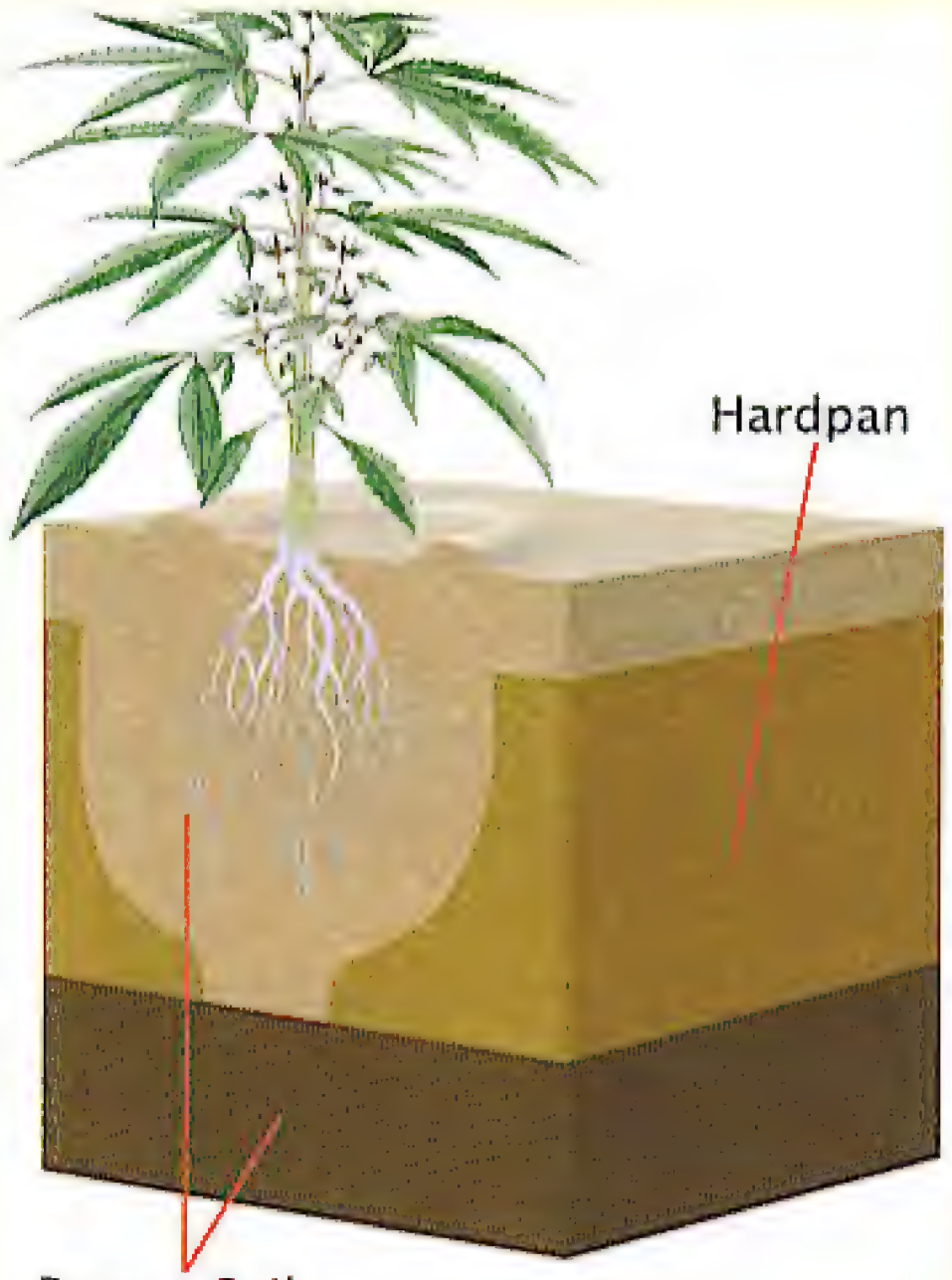
Help reduce the stress by growing seedlings in tall containers (three-inch square by six-inch tall) (8 cm^2 × 15 cm) which will produce a strong root system and a plant that has a better chance of surviving in tough conditions. Adding water-absorbing polymers in the plant mix is an excellent defense against desiccation, too. The crystals expand up to 15 times when watered, making moisture available to the roots for longer periods of time. Slow-release crystals will allow an extended period between watering. This is very helpful if your patch is in a remote location that you cannot visit often.

Mountain areas can have poor soil and will need to be improved before planting for best results. Dig holes at least 18 inches (46 cm) wide by 18 inches (46 cm) deep for each plant. Place a handful of blood meal (see warnings in Chapter Eleven) on the bottom and three to four inches (8-10 cm) of soil on top of it before transplanting the cuttings or seedlings, then water heavily. A little effort preparing the planting holes will result in healthier plants and a heavier harvest.

On an incline, planting holes must be terraced into the hillside and be large enough to catch runoff water. Dig extra gullies to channel runoff to growing plants, and make a "dish" around the plants to hold water.

Plants remain smaller in rocky terrain but often go unseen because they are grown where no one expects to see them.

Clay forms an excellent underground planting container. After a good rain, dig large planting holes. Fill holes with lots of good dirt and compost. Backfill in layers; for example, fill a three-foot (90 cm) deep hole with an eight-inch (20 cm) layer of steamed bone-meal (see warnings in Chapter Eleven) and soil. The balance is made up of a thin layer of topsoil mixed with a rich compost-manure-straw mixture, rock phosphate, and seaweed meal. Mound compost and soil about a foot above ground level. It will settle during growing season. See "Organic Fertilizers" in Chapter Eleven for more information.



Cut through hardpan so water can drain.

Digging hole and planting

Prepare to plant by digging a big hole and placing boards at the bottom to stop downward water flow. Add compost, peat moss, coco peat, good soil, organic nutrients, polymers, and dolomite lime–all will help soil hold water–then top with a concave bowl of soil that will catch rain and irrigation water.

Raised beds

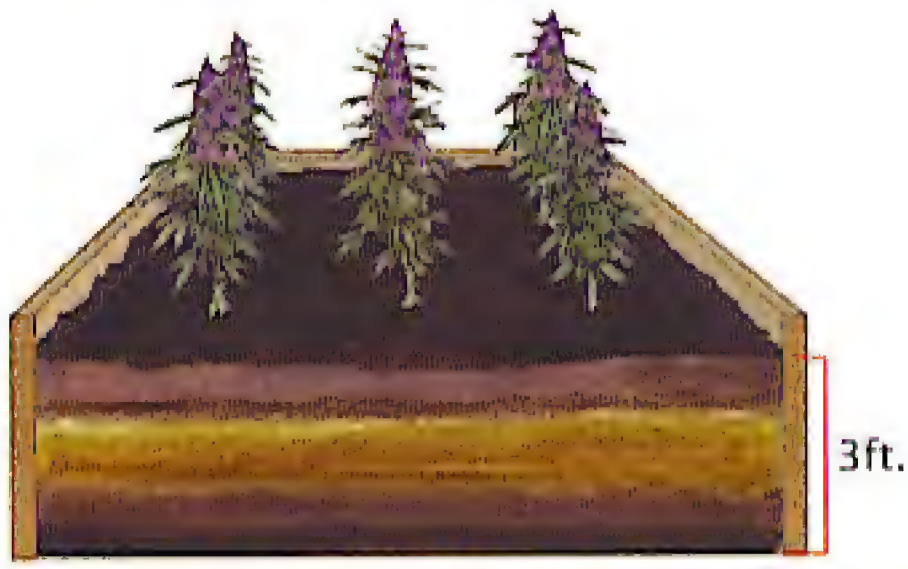
Raised beds are wonderful for growing in the backyard. Cultivation and weed control are easier, and soil quality is simpler to maintain.

Build a raised bed on top of clay soils. Planting in a bed raised six to eight inches (15-20 cm) eliminates the necessity of trying to dig in clay while providing the early warmth and good drainage clay lacks. Plants can be put into the ground two weeks to a month early and may even produce an early spring crop.

One friend plants on top of the compost pile. He plants six, 12-inch-tall (30 cm) clones into three to four inches (8-10 cm) of good soil that

Dig big, deep planting holes and backfill with amended soil.

Place a board at the bottom of fast-draining soils to hold water longer.



Make raised beds up to 3-feet (90 cm) tall. Layers of fresh plant debris below decompose and release heat as a by-product.

is on top of a two- to three-foot (60-90 cm) high compost heap. By the time the roots penetrate into the compost, it has cooled enough that the roots are safe from burning. He places a portable greenhouse over the plants. The compost keeps plants warm while the structure protects foliage. This works exceptionally well to coax a spring harvest.

Another grower prepares a vegetable garden by dumping three cubic yards (90 cm^3) of finished compost and manure with a dose of dolomite lime into a raised bed, then he rototills and plants. When the vegetables are growing well, he transplants hardened-off clones to blend in alongside vegetables.

Mulch

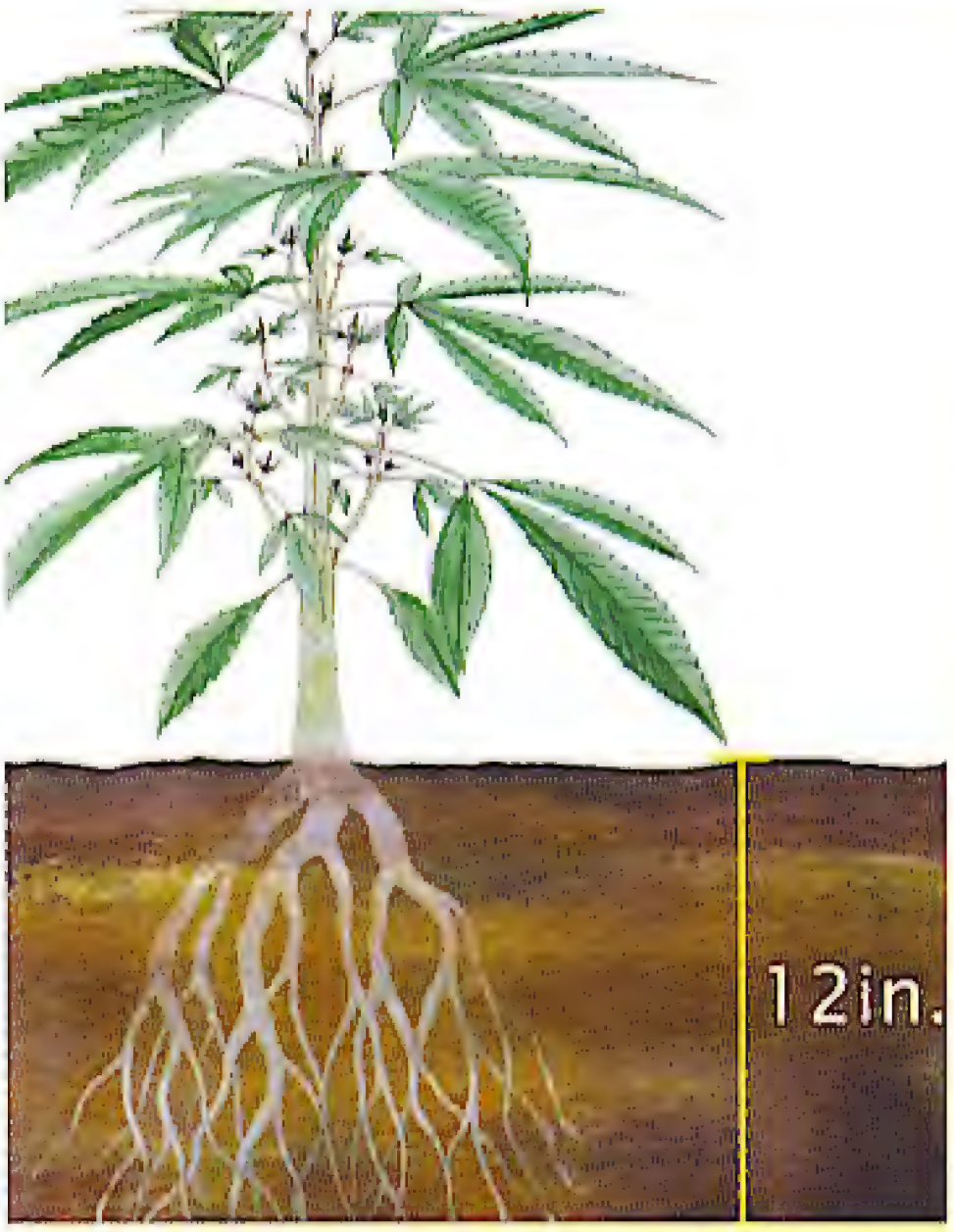
Mulch attracts and retains soil moisture and smothers weeds. Mulch is a layer of decomposing foliage, straw, grass clippings, weeds, etc. and/or paper, rocks, plastic, etc. laid around plants.

Native foliage is an excellent and convenient mulch. My favorite mulch is dry grass clippings, which are free. Fill your backpack with lightweight grass clippings before every trip to the patch. Always pile the mulch as high as you can (6-12+ inches (15-30+ cm), because it biodegrades over time.

Biodegradable plastic breaks down into frayed strips that flap in the wind after continued exposure to sunlight. Plan to use it one year only and remove it before it shreds into unsightly pieces of long plastic.

Rock or rock dust makes excellent mulch. Use rock mulches where they are readily available. They become hot to touch on sunny days, but they still protect the soil from evaporative moisture loss.

Newspaper or brown paper shopping bags make excellent mulch. Slightly wet paper is easier to work with and less likely to blow around. Inexpensive and readily available, newspaper layers should be at least six pages thick (preferably a dozen or more), before adding a soil or mulch covering to hold it in place.



Planting in a thick layer of mulch is a good way to conserve moisture.

Woven weed barriers or strips of scrap carpet let water drain but will not let the weeds grow through. Cover these barriers with rock or bark chips.

Cover the entire garden bed with black plastic and cut holes through which seedlings are planted. A soaker hose can be laid underneath the plastic to irrigate. Make sure to cut large enough holes so that plant stems do not touch the plastic. Black plastic gets very hot during the day but actually warms the soil very little. When a young, tender plant stem touches the hot, black plastic, it will literally cook at the soil line.

Fertilizers

Plants can be fertilized enough to make them respond and grow well within a temperature range of 60-90°F (15-32°C), reasonable humidity, adequate sunshine, and moderate wind.

Be sparing with fertilizer the first month after transplanting. Depending upon the fertilizer, application could be as often as every watering or as seldom as every week or two.

If fertilizing with every watering, you may need to dilute the food to half-strength or less until you figure out the proper dosage.

Fertilize with a mild, soluble flowering solution for germination and seedling growth. Change to a high-nitrogen formula during the vegetative stage and back to a "super-bloom" when the long nights induce flowering.

Use granular concentrated fertilizers or organic fertilizers that are lightweight and not bulky to transport and store.

Build organic soils using different natural substances. Always use the most readily available form of the element. See Chapter Eleven, "Water and Nutrients," for complete information on fertilizers.

For more complete information about soil, see *Soil Science Simplified*, by Helmut Kohnke and D. P. Franzmeier, Waveland Press, 4th edition.

Water

Clean rainwater is the best for irrigation. To make sure it is not too acidic (acid rain) and harmful to plants, take the pH and parts per million (ppm) reading from collected rainwater before using.

Sodium-heavy water builds up in the soil causing slow growth and shorter plants with smaller leaves. At low levels, sodium appears to benefit plants and may even make up for potassium deficiency, but too much leads to "sodium stress." Roots lose the ability to absorb water and other nutrients and will dry out even with heavy watering. It is very important to test your water for sodium and other dissolved solids and take appropriate action if the reading reaches more than 50 ppm. Sodium is more of a problem when growing in containers than when growing in well-drained soil.

See Chapter Eleven for more information on sodium and water quality.

Local farmers or the Department of Agriculture have information about water solids in your area, and many areas have low-cost, state-certified labs that can test your water for you.

Often, if the sodium content is below 300

Drip irrigation is a very efficient way to irrigate.

Water small plants by hand until they are established.

ppm, a good flushing every month will keep sodium and other salts from building up to toxic levels.

There are several easy, inexpensive options to improve water quality.

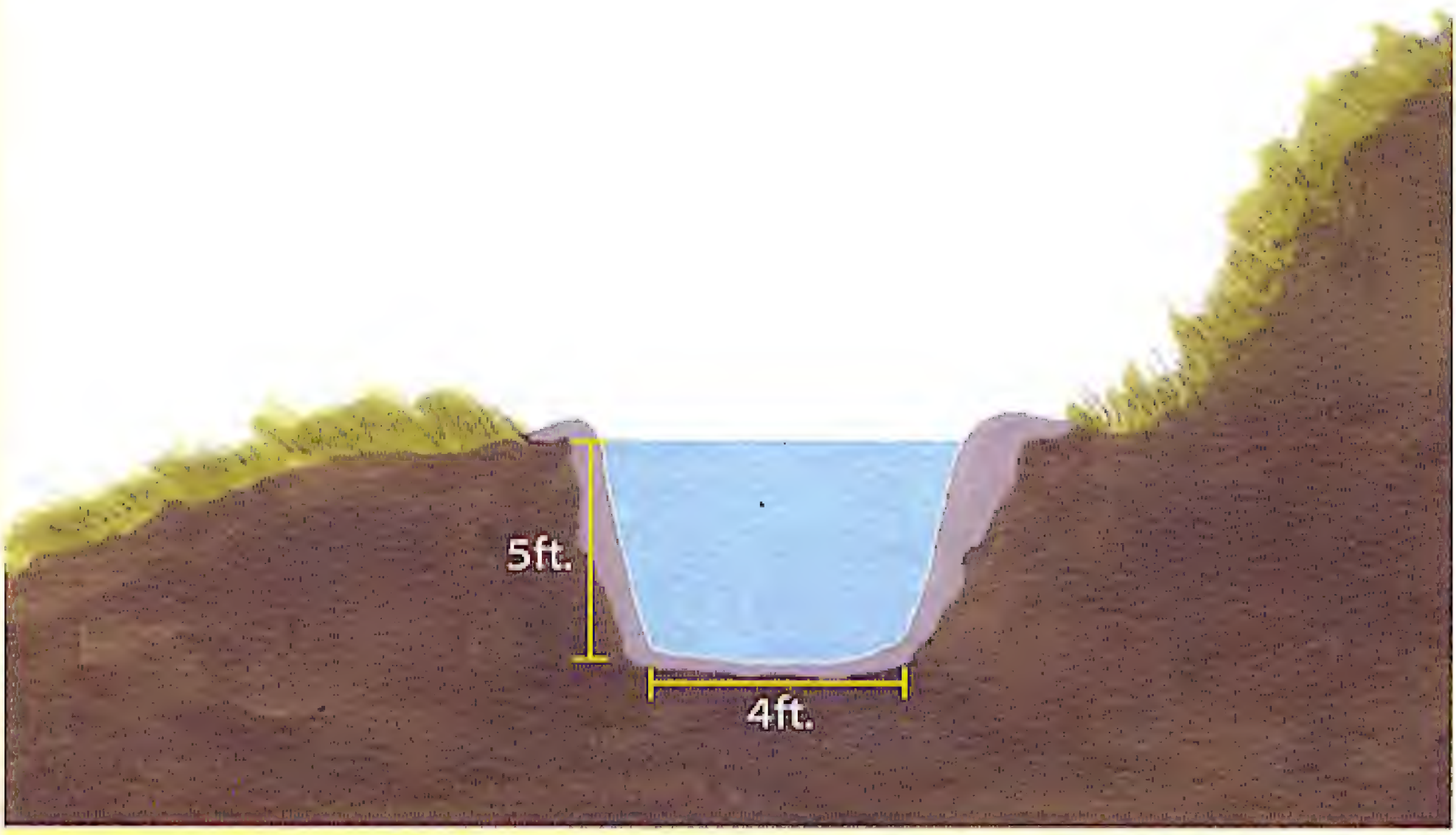
Irrigate seedlings, clones, and mother plants with rainwater (or 50 percent rainwater with tap water) to dilute dissolved solids.

Flush container gardens with three quarts (3 L) of water for each dry quart (liter) of soil.

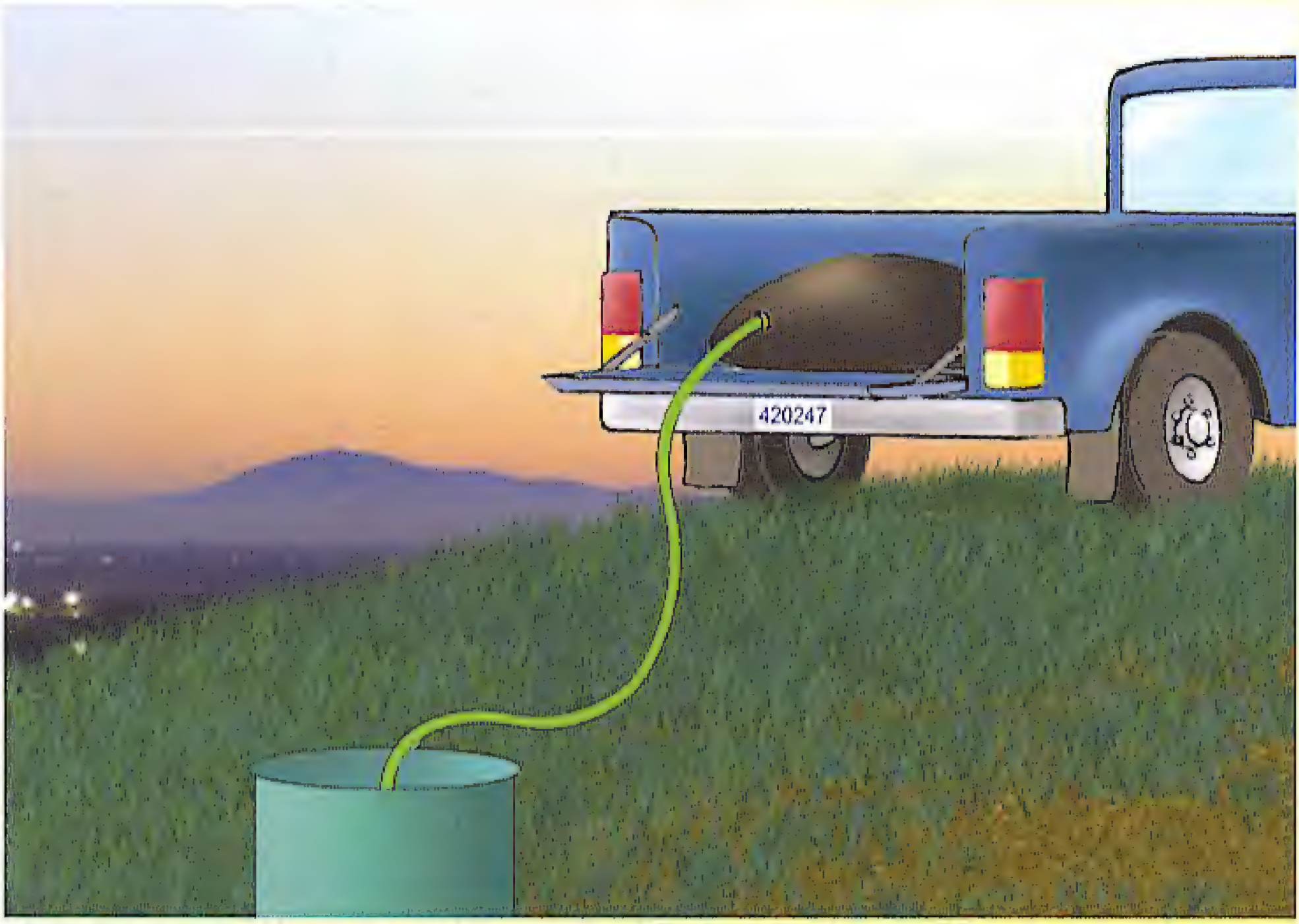
Water once with tap water and always afterwards with tap water augmented with ammonium sulfate.

Clean tap water by filling barrels and setting 2-3 feet (60-90 cm) off the ground. Add ammonium sulfate to settle out the sodium, then siphon water from the top of the barrel, refilling after each watering to allow the chlorine to evaporate. Chlorine, like sodium, is beneficial in small amounts. It is essential to the use of oxygen during photosynthesis and is necessary for root and leaf cell division. But too much chlorine causes leaf tips and margins to burn and leaves to turn a bronze color.

Empty the barrel periodically, and scrub out



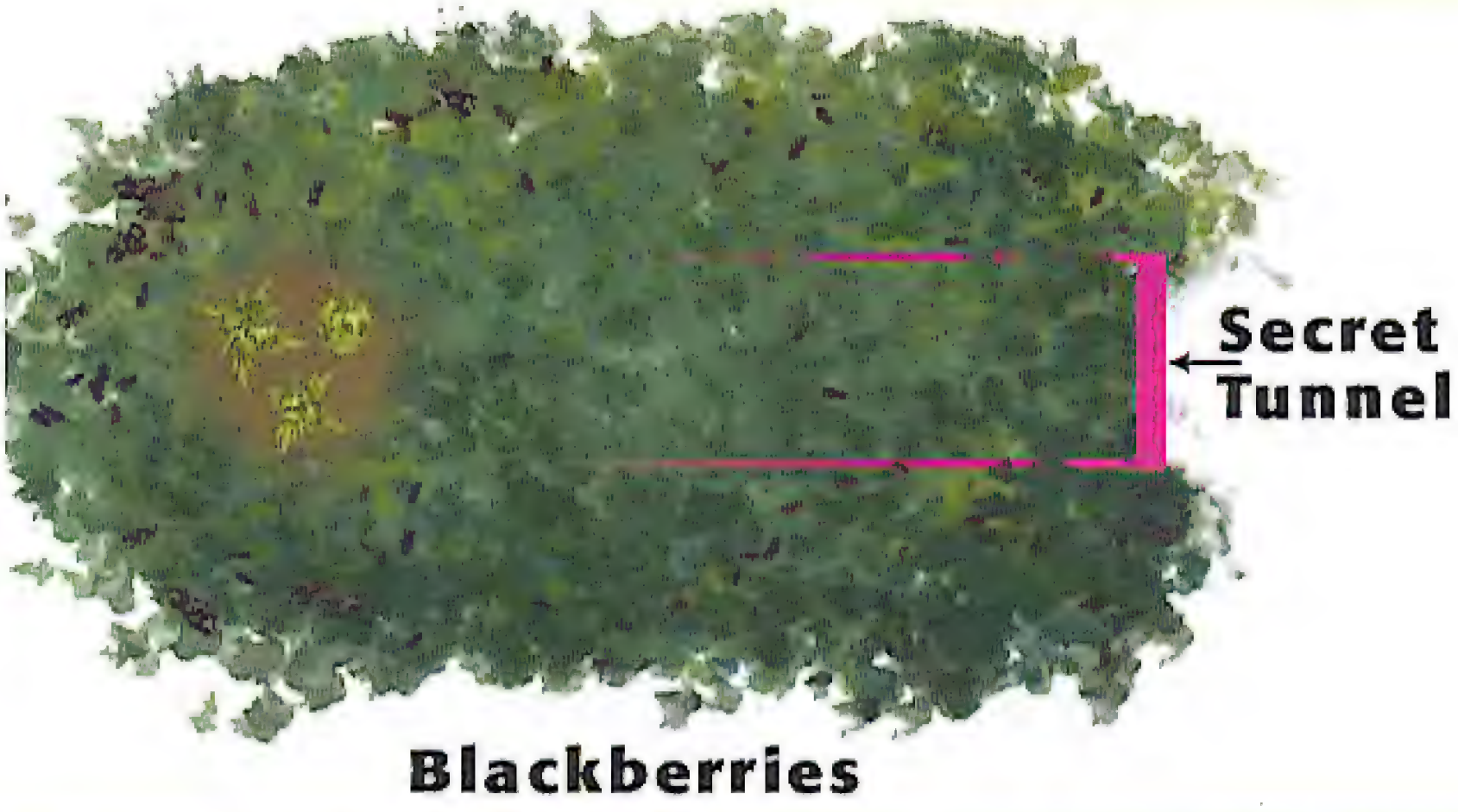
Make a reservoir by digging a hole and lining it with heavy-duty plastic. Always cover it to limit evaporation and animal access.



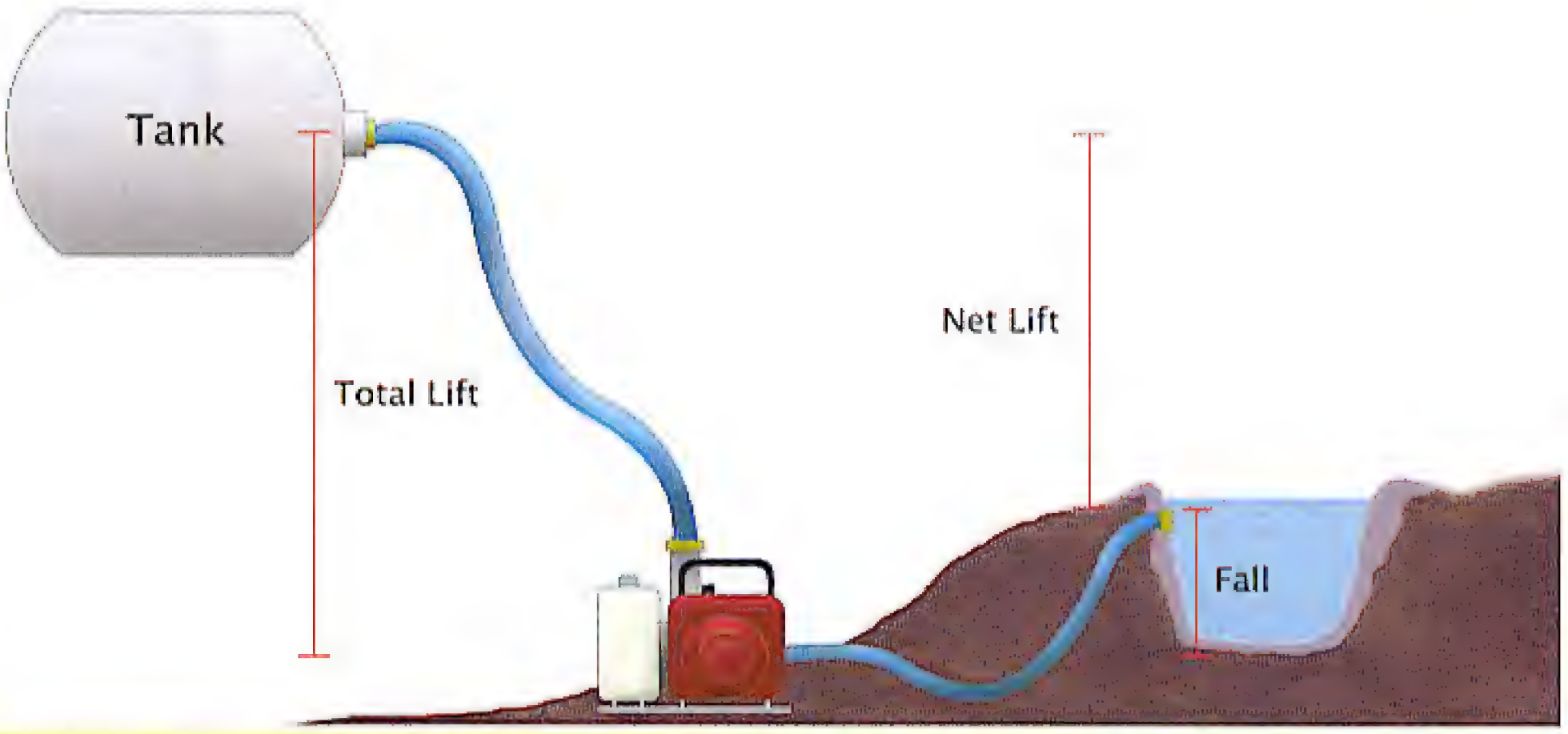
Siphon water you haul in to a receptacle located downhill. Always plan trips carefully and avoid problems.

residues and sediments. Clean rainwater is an excellent choice for irrigation. Collect runoff by placing a barrel under a downspout. Mix the rainwater with barrels of tap water to dilute the dissolved solids. Roofs and terraces can accumulate trash, which will pollute the otherwise clean rainwater. Covering your catch-barrel will prevent evaporation and keep out trash.

Sodium, calcium, and magnesium can be harmful in the soil, too. Excess calcium, for



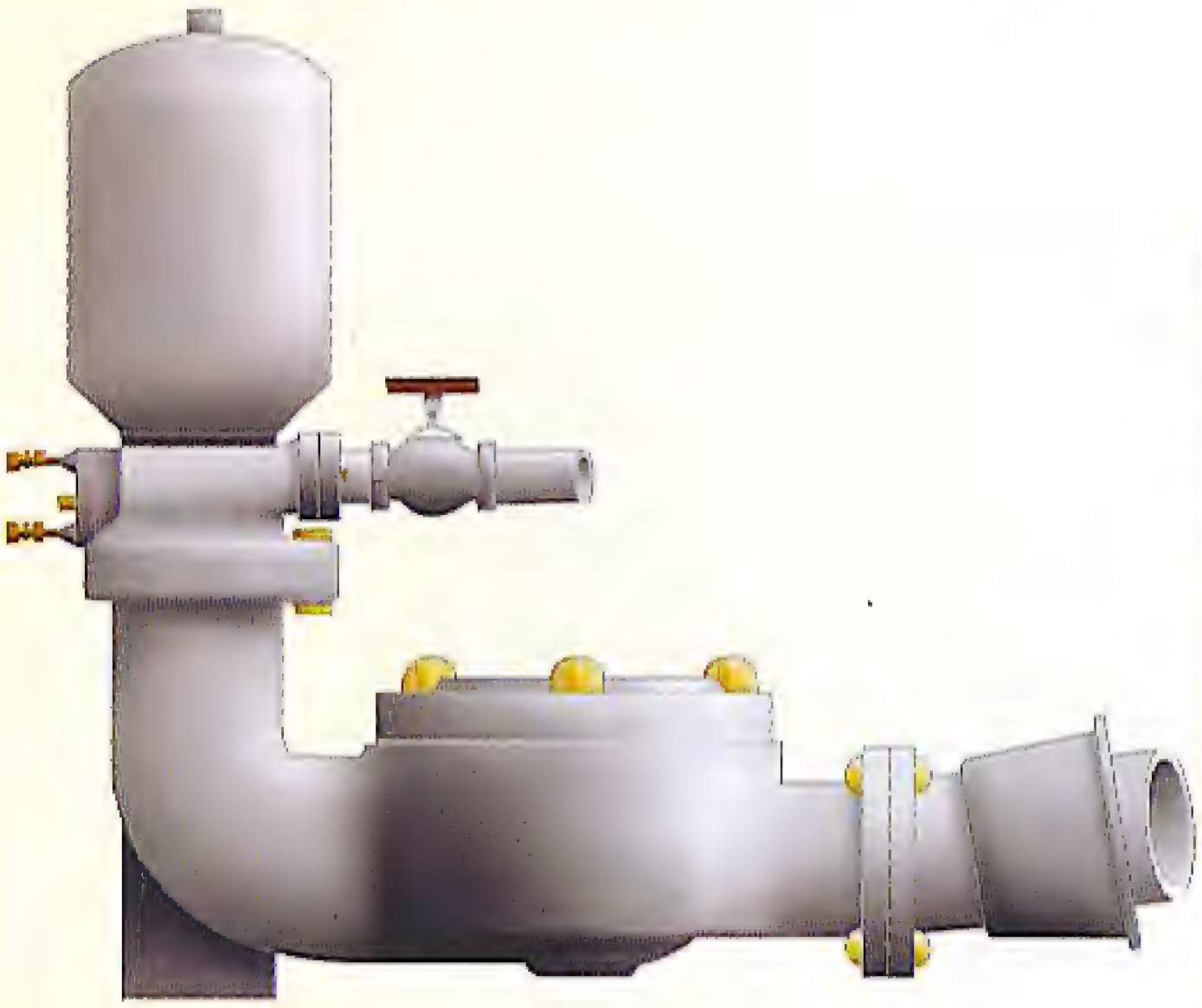
Planting inside a patch of blackberries or other sticker bushes will deter many curious hikers and other animals.



The High Lifter is remarkably efficient and one of the best options for guerilla growers.

Right: Drill powered pump that uses a rechargeable battery. Attach a pump to the end of the drill. Remove cord and make battery powered.

Below: A ram pump is one of the original low-tech methods to lift water with the force of gravity.



Above: The Grobot is an outstanding invention! This battery-powered pump delivers water to three plants quietly and efficiently.

example, keeps the pH level too high and blocks uptake of several nutrients including iron and potassium. Fertilizer with chelated iron will counteract this problem. Too much magnesium creates rapid uptake of trace elements but does not usually cause a problem.

The fertilizer comes in liquid or wettable crystal form and can also be used in soil to alleviate problems caused by bad water. Several commercial hydroponic fertilizer formulations for "hard water" are available and work very well.

Check the garden daily, if possible, and water when soil is dry one inch (3 cm) below the surface. Irrigate containers until 10-20 percent of the water comes through the drainage holes. Irrigate plants in the ground until they are completely wet.

Many different types of receptacles and reservoirs can store irrigation water. Use the biggest storage unit that you can manage; you will always need water. One good option for storing a lot of water is to dig a nice big hole and line it with a pond liner. For all kinds of water storage devices, see www.realgoods.com.

Pumps

Pumps move water long distances and uphill. Pumps can be operated by hand, batteries, gasoline, gravity, and with pressure from moving water.

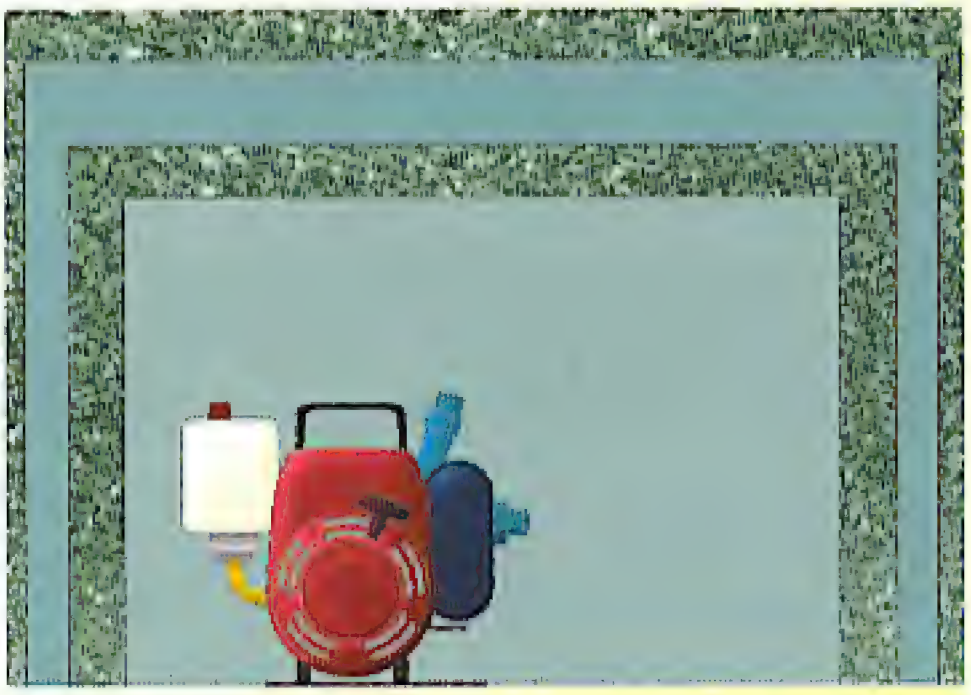
Gasoline-powered pumps are reliable and can lift much water uphill quickly, but they are noisy. You can purchase a pump already attached to the motor or connect them yourself and mount them on a board. Check your local *Yellow Pages* for a good supplier.

Noise is a major factor in starting up a small gasoline-powered engine in the middle of a quiet mountainous area. An oversized muffler and small baffle will deaden most of the exhaust sound.

Set up the pump so that the intake will be able to gather water easily. Make a small dam only if it is discreet.

A ram pump pumps water from a source of flowing water above the pump. The force of gravity is all the power needed. Ram pumps are rugged and dependable, but noisy. www.ram-pumps.com.

A gasoline-powered pump moves much water uphill, but they are noisy!



Build a baffle around gasoline-powered motors to muffle noise.

The High Lifter Water Pump is water-powered and will work with a low flow of water. The unique design uses hydraulic pressure and is self-starting and self-regulating. If inlet water stops, so does the pump; the pump starts by itself as soon as water flow begins. www.realgoods.com.

Manual-powered pumps require a lot of physical energy to operate and are impractical for moving a large volume of water uphill.

Solar energy is an outstanding way to move water. On a sunny day a 75-watt solar panel supplies enough power to a pump to move 75 gallons (285 L) of water 35 feet (10.5 m) uphill

Cold-affected plants develop few calyxes but still frost with resin.

Cold temperatures turned this plant purple and curled the leaves.

and more than 400 feet (120 m) away to a reservoir. www.otherpower.com.

Siphoning water downhill will move a lot of water. Finding a water source above the garden is the key!

Lightweight hose will not disturb foliage. If you can find it in black, it will be more difficult to spot. Most garden hose is a bright green color!

Temperature

The best way to control temperature outdoors is to plant in the right place. Normally hot temperatures are common during midday in full sun. Cannabis virtually stops growing at 85°F (29°C). If you are planting in a hot climate, make sure plants receive filtered sunlight during the heat of the day. Also, plant them in natural breezeways so a breeze will cool them during the heat of the day.

You can create shade over your patch by bending tree branches and tying them in place.

Cold temperatures can be avoided by planting at the proper times–well after last frost. Harvest before first frost!

See Chapter Thirteen, "Air," for more specific information about temperature.

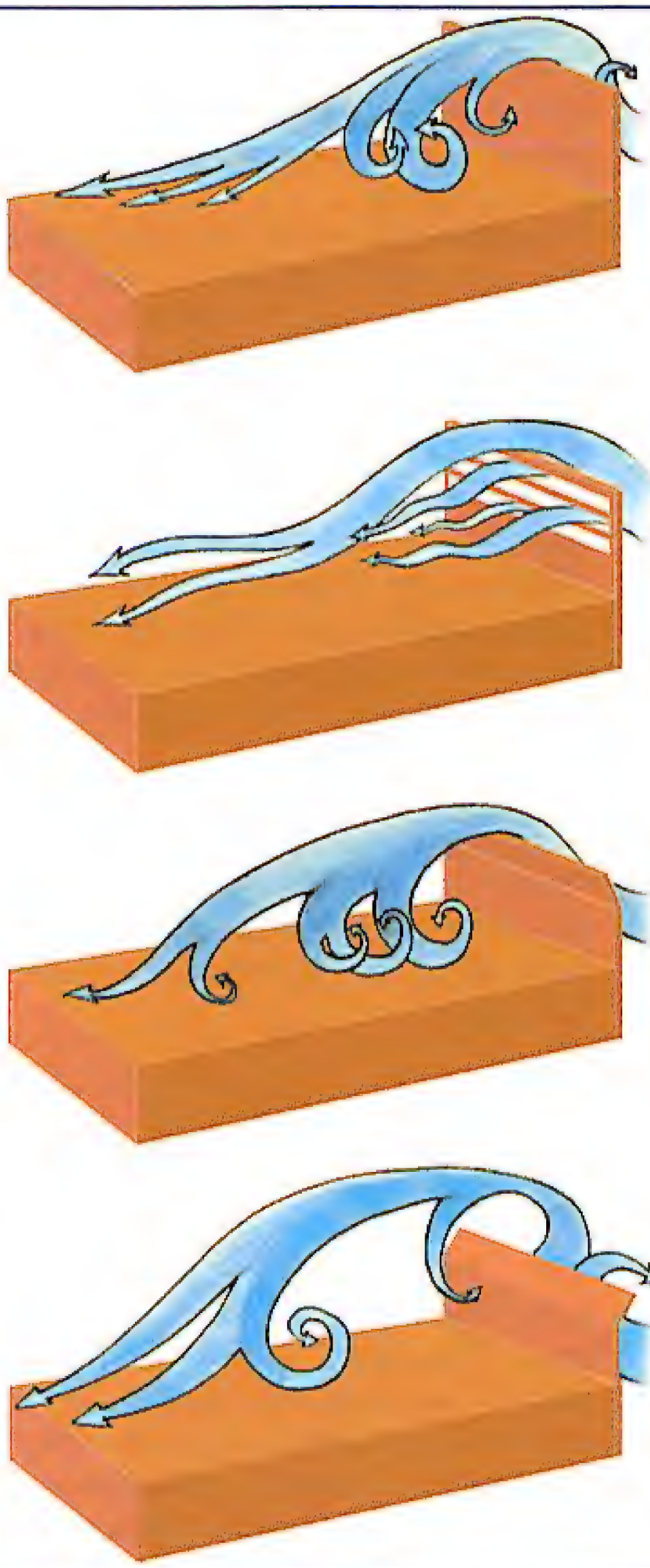
A shade house covered with "shade cloth" (synthetic sun-blocking material) or lath house, which is built from thin, narrow strips of wood, are great places to protect plants. Lath houses can provide 25 percent shade or more depending on the placement of the laths. Shade cloth is available in different meshes that filter out 10, 20, 30, etc., percent of the sunlight. Shade or lath houses are also a great place to pass summer days!

Wind

Wind is one of the strongest forces outdoors. Sustained wind will suck moisture from plants. Wind causes plants to draw moisture from the roots and shed it through the leaves in a defensive mechanism to regulate internal temperature and chemistry. It creates a problem if the water supply is limited.

For example, Southern Spain and other arid regions are subject to strong desert winds that transport abrasive sand and other particles. We call it "kalmia" in Spain because the grit is mixed with saline air from the Mediterranean. These winds can destroy crops. If your climate is plagued by such abrasive winds, protect plants with windbreaks. Wash foliage with plenty of water to remove the particles after windstorms.

Moderate sustained winds will dry out container- and field-grown crops within a few hours. Container crops suffer the most. For example, plants grown in five-gallon (20 L) containers on a terrace that receives full sun and constant moderate winds uses about two gallons (7.5 L) of water daily! Indoors, the same plant would use 75 percent less water!



1. A solid wall causes air to drop and whirl about the same distance equal to the height of the wall.

2. A louvered wall diffuses air and protects plants 6-12 feet (1.8-3 m) from wall.

3. A solid wall that is angled into the wind protects plants close to the wall.

4. A solid wall that is angled away from wind protects plants up to 8 feet (2.4 m) from the wall.

Plant in protected areas so the garden suffers little effect from strong wind.

Pests and Predators

Once your plants are in the ground, well-fed, and watered, check them weekly (if possible) for pest and fungal damage. Inspect the top and bottom of leaves for stippling (small spots) from mites or damage from chewing insects and slugs and snails. First identify the pest, and then determine a course of action.

Properly grown outdoor cannabis has few problems with pests. See Chapter Ten, "Soil," for more information on a wide array of diseases and pests that attack cannabis.

Low-tech, natural approaches to pest control work well. A few large pests like caterpillars and snails can be hand-picked from the foliage. Caterpillar populations can be reduced at the source by installing bat houses. Resident bats will eat moths and decrease the number of chewing caterpillars. Birds will eat caterpillars too, as well as aphids and other insects. Attract birds with suet, bird houses, baths, and feeders but cover tender seedlings and clones with wire or nylon mesh to protect from birds, too! Ladybugs and Praying Mantis are good options for insect control and can be purchased from nursery supply stores.

Barns owls eat mice, gophers, and voles but are hard to come by in the city. If you are lucky enough to have them nearby, take advantage of their ability to eat plant pests. On the other hand, some rodents, like moles and shrews, help your garden by dining on slugs, insects, and larvae.

Marigold cultivars of the *Tagetes erecta* and *T. patula* species, will repel nematodes, also known as eelworms, from the soil for two to three years if they are planted in an infested area and then tilled under. Just planting them in an area doesn't accomplish anything. Numerous tests indicate that they do not have an effect on insects above the ground.

Frogs and Toads

Frogs and toads eat insects and slugs. The frogs will need a water source, while toads are more terrestrial. Large snakes in the garden will eat gophers, squirrels, and mice as well as the moles and shrews. Snakes can give you a good scare if you come across one unexpectedly! The snake will also want to eat your frog. Plan carefully before committing to any mini-predator solution to pest infestation.

Birds

Although most birds are welcome guests in most gardens, there are some that can make quick work of tender seedlings or new clones.

The most effective way to keep birds from freshly planted seed and transplants is to cover plants with plastic wire or plastic netting. When installing the netting, make sure it is securely fastened around the perimeter of plants so hungry birds do not get underneath.

Deer and Elk

Deer and elk love newly formed growth on cannabis plants. In addition, they may destroy crops by trampling them. Elk are somewhat of a problem, and deer are a problem!

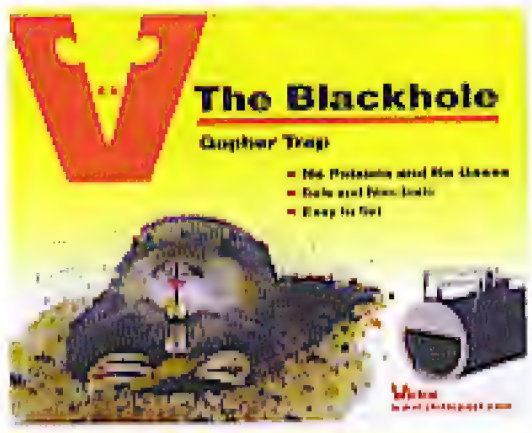
A cage around plants is the best deterrent. But remember, the wire may be easy to spot if it is not discreet in color. Deer are repelled by the smell of blood and human hair. Place handfuls of dried blood meal in cloth sacks and dip in water to activate the smell. Hang sacks from a tree to discourage dogs and other predators from eating them.

Handfuls of human hair can be placed in small cloth sacks and hung from a fence or tree branch as a deterrent. Do not use your own hair; it could turn into evidence for police! Scented soaps have repelled deer from some gardens. But if deer are very hungry, the smell of blood meal, human hair, scented soap, or anything else will not deter them.

Always urinate in several locations around the perimeter of the garden so animals take your presence seriously. Some growers save urine all week and disperse it at regular visits to their patch.

Deer easily bound over eight-foot (2.4 m) fences. A good deer fence is eight feet (2.4 m) tall with the top foot (30 cm) sloping outward, away from the garden at a 45 degree angle. Electric fences and large dogs are also excellent deterrents.

Gophers



Gopher Trap

Pocket gophers are small burrowing rodents that eat plant roots and foliage. These herbivores find fleshy roots a real treat and occasionally attack cannabis. Should a family of gophers move into your area, get rid of them as soon as possible! Females can bear up to five litters of four to eight offspring a year. A family of gophers can clean out a large garden in a matter of weeks.

The only sure way to get rid of gophers is by trapping. There are several gopher traps available, including ones that capture them alive. It will take some skill before you are regularly able to catch gophers with traps. You must avoid getting human scent on any part of the traps. If gophers sense the human odor, they will simply push soil over the trap to spring it or render it

otherwise ineffective. Traps are put in gopher runways and so don't need to be baited.

A fence of poultry wire or 0.5-inch (1.5 cm) hardware cloth buried one foot (30 cm) deep and standing 3 feet (90 cm) above the ground will exclude gophers. Line planting holes with chicken wire before filling with soil. Driving metal sheets around the perimeter of planting holes will also prevent gopher damage.

Mice and Voles

Mice and voles can chew bark from around the base of cannabis plants (girdling). If this is a problem, keep mulch a foot away from plants, and install a wire mesh around the trunks. Mice and voles make nests in large piles of mulch, and they are attracted to stored water. Cover all water sources to exclude them, but keep in mind that they might chew through the container if water is super scarce.

The best mouse deterrent is a cat that is serious about hunting. Mousetraps also work well on smaller populations. Removing a large number of mice with traps can be tedious and unpleasant.

DO NOT USE POISON! Scavenger animals will eat the dead rodents and may become poisoned themselves.

Moles

Moles are minor pests. They are primarily insectivores that eat cutworms and other soil grubs, but their tunnels may dislodge cannabis roots.

Repel moles with castor plants or gopher (mole) plants (*Euphorbia lathyris)*. Castor bean leaves and castor oil, as well as applications of tobacco and red pepper, will repel moles if put into their main runs.

Blend two tablespoons (3 cl) of castor oil with three tablespoons of dish soap concentrate and ten tablespoons (18 cl) of water. Mix in a blender. Use this as a concentrate at the rate of two tablespoons per gallon (4 ml per liter) of water. Apply as a soil drench directly over mole holes.

Barrel traps, scissor traps, and guillotine traps are effective and kill moles instantly.

Rabbits

Rabbits eat almost anything green, and they multiply like rabbits! Repel rabbits with a light dusting of rock phosphate on young leaves or dried blood sprinkled around the base of plants. Manure tea sprayed on leaves and soil may keep them from dining on your plants. Rabbits find plants dusted with hot pepper or a spray of dilute fish emulsion and bone meal repulsive. There also are a number of commercial rabbit repellents, but be wary of using these on consumables!

A dog will help keep rabbits in check, but the only surefire way to keep rabbits out of the garden is to fence them out with one-inch (3 cm) poultry wire. The poultry wire should be buried at least six inches (15 cm) in the ground to prevent burrowing and rise two or three feet (60-90 cm) aboveground. Wrap trunks with a wire mesh or aluminum foil to keep rabbits from chewing bark in winter or early spring.

Rogue Pollen

Rogue pollen from commercial hemp farms and wild or cultivated males can threaten sinsemilla cannabis grown outdoors or in greenhouses. Undesired pollen can drift from a few feet to hundreds of miles to pollinate flowering females and cause them to grow seeds.

Large clouds of pollen blow across the Mediterranean Sea from the Riff Mountains in Morocco dropping pollen on Spain and Portugal. In fact, local weather reports always include the cannabis pollen statistics. The reports are directed at people with allergies but are also used by marijuana growers.

Make inquiries into air quality including cannabis pollen. Some growers develop "allergies" in order to get the most information from

officials. Researching wind direction relative to your crop and closest hemp plants will help you select sites less likely to be contaminated.

Wind-shadows (large divots in a hillside) protect plants from wind and anything it brings along.

If rogue pollen is a problem, plant early crops or late crops that flower before or after male plants. Usually June and July are the worst months for pollen, but it could also spill into August.

A backyard garden is not always a security risk.

Remove the bottom of containers and plant in the garden to avoid transplant shock.

You may be able to grow indoors until the industrial hemp is done flowering and males are no longer releasing pollen, or plant out of the wind pattern. If pollen is severe, keep plants in a greenhouse. Cover the intake opening with a moist towel–humidity makes pollen unviable. Put one edge of the towel in a bucket of water to wick moisture. Wetting down the exterior of the greenhouse will also help incapacitate any wild pollen.

Backyard Growing

Lucky growers who live in countries that tolerate cannabis can safely plant a crop in their backyard and give their garden the tender loving care it deserves. You can pay close attention to your plants' soil, water, and nutrient needs. Growing cannabis in your flower and vegetable garden is ideal because you can care for all your plants at the same time.

Prepare soil in the fall; remove weeds and dig

Small 'AK-47' plants are easy to move and give a 12/12 day/night schedule during the summer.

planting holes or garden beds. Turn it over and make sure it has plenty of amendments (see Chapter Ten). Always put a heavy layer of mulch on any soil that will be planted! A 12-inch-plus (30 cm+) layer of mulch will keep soil elements intact as well as attract moisture. Bare soil loses most of its valuable topsoil to erosion during winter months.

In the spring, mulched amended soil should be well-mixed and ready for planting. You can transplant cannabis seedlings or clones in the garden just like you would tomatoes. If your soil is poor, or you didn't begin cultivation in fall, dig large holes, three feet (90 cm) in diameter by three feet (90 cm) deep, and fill with your best compost, potting soil, or planting mix. Otherwise, break up the top six to eight inches (15-20 cm) of soil in a six-foot (1.8 m) radius to provide room for root branching.

Bury containers in a garden bed so they do not stick out too much. They can be easily moved indoors at night or to a remote location.

Put pots inside another container to protect roots from being cooked by heat from the sun.

Terrace Growing

Growing in containers on a terrace, balcony, or roof is very rewarding. A small sunny location, good genetics, containers, and good soil are the basic needs.

Your gardening techniques will depend upon the location of the grow show. City building rooftops, terraces, and balconies tend to be windy. The higher the garden, the more wind. Wind dries plants quickly. See "Wind" in this chapter.

Patio gardens are most often protected from strong winds and strong sunlight.

An automatic watering system is often a good idea in such gardens to ensure they receive adequate water, especially if you are gone for a few days.

Pots will also need to be shaded from sunlight. Hot sun beating down on pots cooks plant roots. See Chapters Six ("Grow Rooms") and Ten ("Soil") for more information.

Beautiful plants line this protected Spanish terrace.

Containers with wheels are much easier to move, especially if you are moving them back and forth from indoors to outdoors.

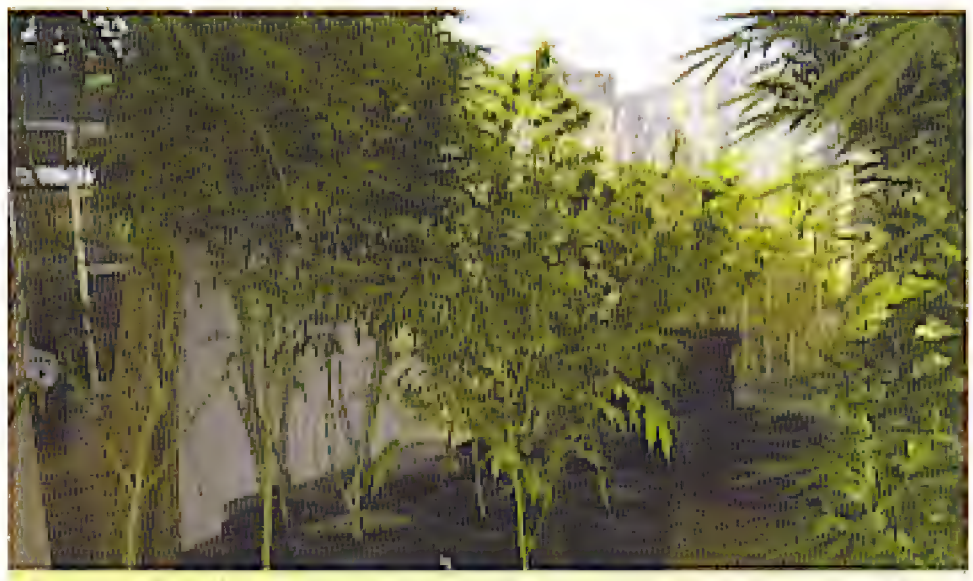
Even with adequate security, the standard issues of water, soil, and fertilizer apply. For a successful crop, daily maintenance is essential during hot and windy weather.

Wind can carry rogue male pollen or industrial hemp pollen creating problems for terrace growers. Plan ahead. See "Rogue Pollen" above.

This cannabis plant is growing on a terrace between an ancient church and a high-rise office building.

Large containers require less maintenance and grow big plants.

This terrace garden obscures the door!



Avoid planting too early in the year or lower growth will be spindly.

This short crop was planted and harvested in just 3.5 months!

Basque growers planted this crop in a natural clearing in early summer.

Here is a shot of the same garden (above) a couple months later.

Coastal winds tend to flow inland during the day creating cool zones denoted by blue lines.

Coastal breezes generally carry air from land out to sea at night. Valleys and exposed hillsides experience more wind.

Guerilla Growing

Location

Guerilla growing, a term coined in the early 1970s, requires strategy, time, and most often, physical prowess. Depending upon your location and local laws, clandestine guerilla growing in remote locations could be your only option.

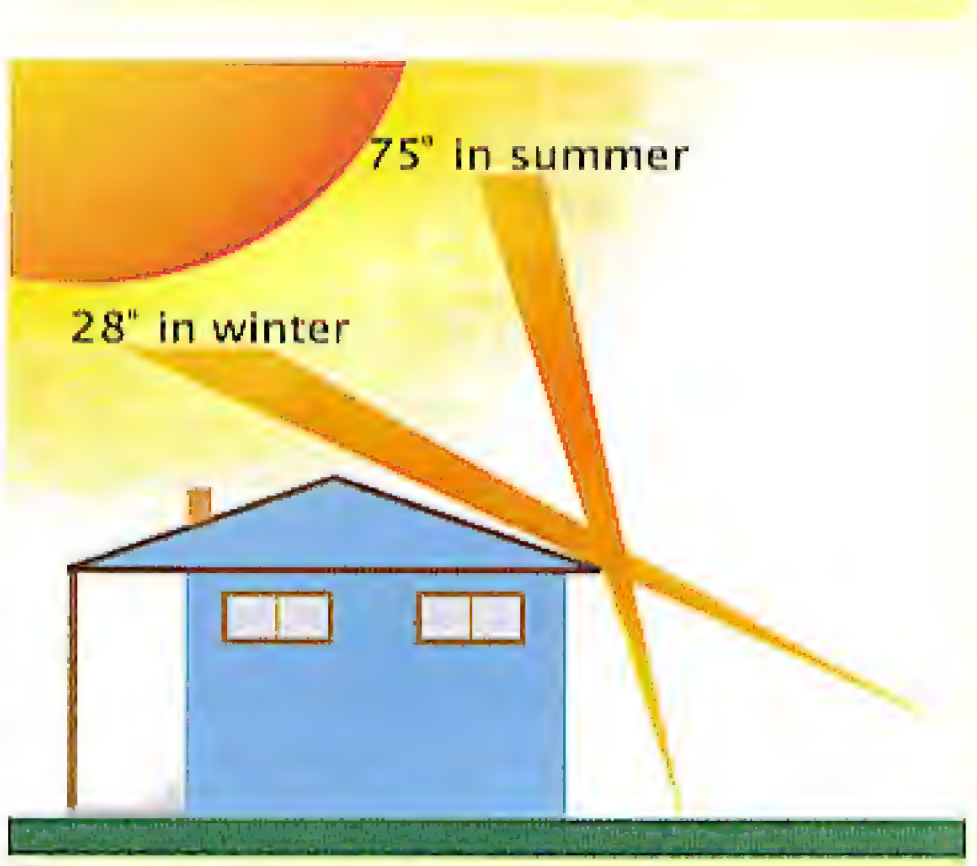
Location and security are the main concerns for a guerilla grower. Choose a location that has limited public access. Check regulations for hunting and recreation, and think of who might be using the area: hunters, mushroomers, other marijuana growers, hikers, dirt-bikers, Boy Scouts, etc. Select a remote site unlikely to be used casually.

Look for a site that already has big green stands of vegetation. Marijuana is a vigorous plant with a large root system, and a flowering female will stand out if surrounding vegetation dies back before harvest. Stands of thorny blackberry bushes, ferns, and meadow grass are good options.

Prepare your marijuana patch up to six months before planting. Remove green vegetation in the fall for a spring garden. Clear a few patches to allow sufficient sunshine, cut back roots of competing plants, and till planting holes two- to three-feet square (60-90 cm^2). If possible, allow amended soil to sit for a month or longer before planting. Remote locations are hard to visit on a regular basis, so proper planning and preparation is important. If your home and guerilla gardens are similar, you can plant an indicator crop like tomatoes as a backyard guide to your hidden plants' condition.

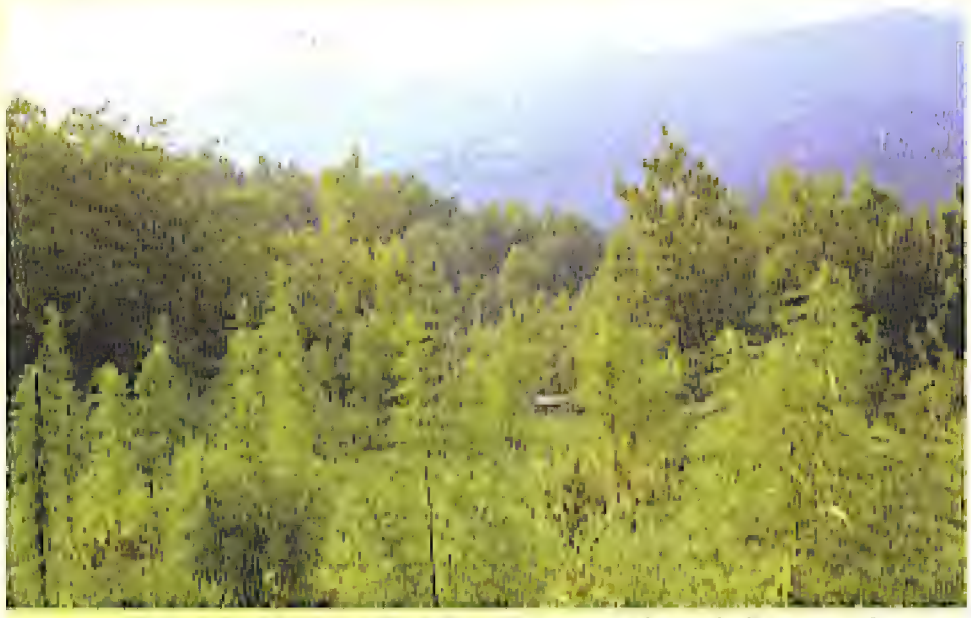
Ample water is an important factor for site selection. If you cannot count on rainfall, locate your garden near a water source that does not dry up in the summer; doing so will make watering easier and cut the chance of being spotted hauling water. Exclusive access by boat will reduce the risk of discovery, but make sure

Cool air tends to sit in natural and man-made valleys which are often a few degrees cooler.



The angle of the sun climbs during the summer, and it is also brighter.

Planting in a corn field offers plenty of cover.



Cannabis plants easily blend into other foliage when planted properly.

your plants cannot be seen from the boat. Many people use waterways and explore land bordering rivers.

Plants need a minimum of five to six hours of sunshine a day. Scout sites in the winter and try to visualize how the trees will cast shadows during the summer months. Remember that the sun takes a higher path in the spring and summer. Five hours of direct midday sun per day is essential for acceptable growth. More is better. Rocky terrain, hillside terraces, and grasslands all receive good amounts of sunlight.

Wind patterns will affect your garden and influence where plants are located. Do your homework. Research average wind direction and force. Windbreaks protect plants from heat and water loss.

Security

A secure location is the number one concern for most guerilla growers. Indoor growers can rent an apartment, house, or warehouse in the name of another person to avoid discovery. Guerilla gardens planted on public land risk detection by hikers, fishermen, or other outdoor enthusiasts. Remember, they are interested in specific sports and recreation. They will not go out of their way to find your patch unless you lead them to it.

Plant in a secure location that is out of sight! A greenhouse or a field of cannabis is vulnerable to both thieves and law enforcement.

Choose a site that does not make your plants the focal point of the garden. Make everything blend into surroundings so there is virtually no trace of a grow show. Hide cannabis among other plants that are of similar size and foliage. Stinging nettles camouflage cannabis well, and if you are unlucky enough to brush up against them, they seem to reach out and bite you, giving a burning sensation for about 20 minutes.

Park your vehicle in a discreet place away from the trailhead to your guerilla patch.

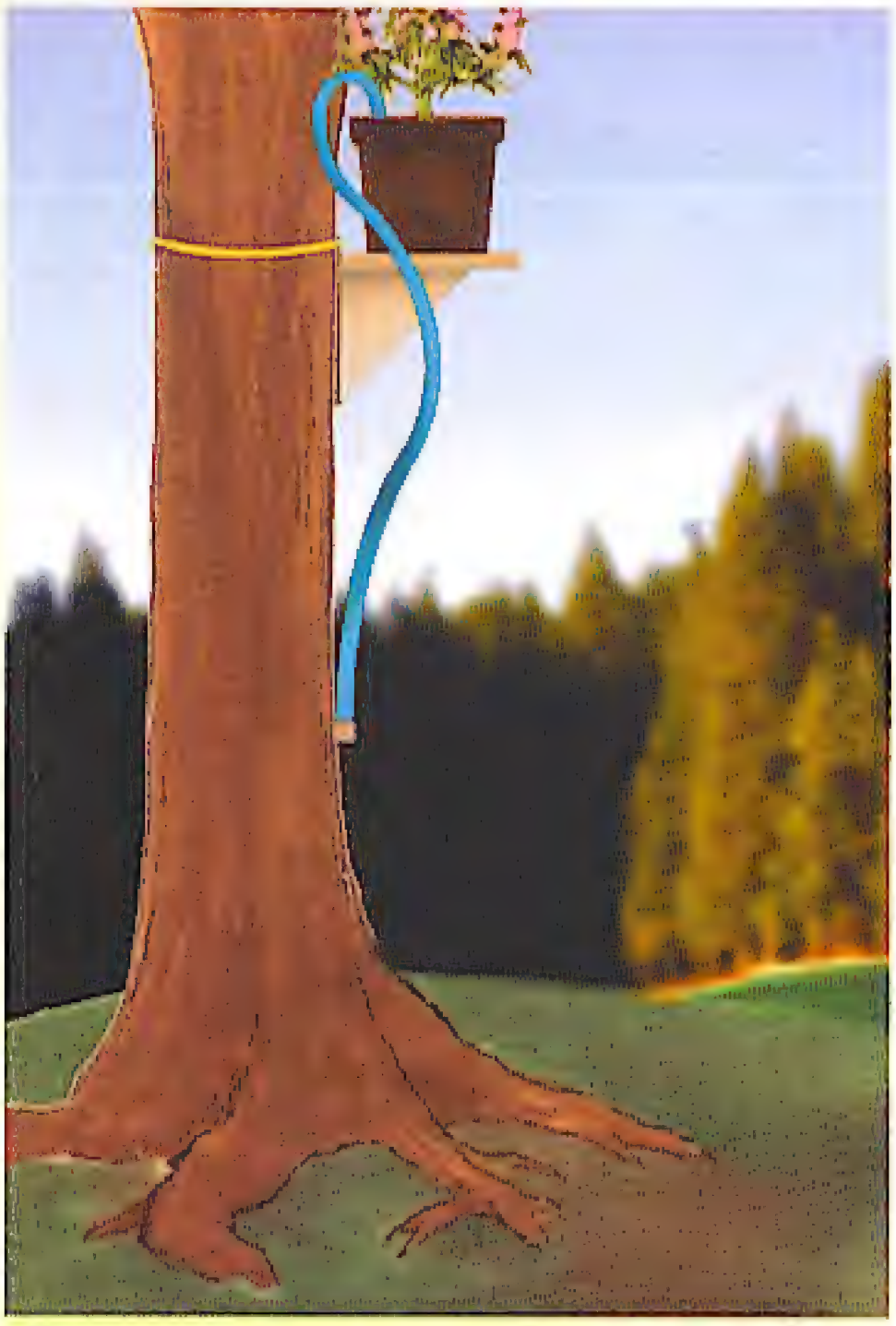
Cover the bottom of your shoes with duct tape to camouflage the pattern on the soul of your shoes.

You can see how cannabis stands out when surrounding foliage dries out in the summer.

Paint containers black, dark green, or camouflage. There are also camouflage sleeves available to cover pots.

Plant 'Ducks Foot' in your garden to fool casual observers into believing it is not cannabis!

A big dog will keep bandits at bay!



Plant on a tree stand to make plants harder to detect.

Be prepared with a believable story about why you are hiking around. Some possible ideas include bird watching, fishing, wildflower photography, etc. Make sure to have some props: fishing pole, camera, bird identification book, etc., to corroborate your story. Stay alert; this is risky business!

Some growers prefer to visit their patch late in the afternoon when the bulk of visitors are most likely to be in the forest. Now you will have plenty of time to complete tasks, and when the sun sets, you can return under the secure veil of twilight.

If you prefer to visit your grow show in the early morning when it is dark, a flashlight with a red or green lens helps your eyes adjust.

Always carry a cell phone to call for help or to communicate with a partner while at the patch. Turn the ringer off!

Prevent making a distinguishable path to the patch by taking a different route every visit. Walk on logs, rocks, and up stream beds to avoid detection. Rapid growth of native plants will erase any obvious trail. You can fertilize to assist in repairs, but be careful with application as wild plants are easily over-fertilized. Remember, in late summer and early fall, most native plants in dry climates will not regrow.

Bring growing supplies to the patch and stockpile them over time–PVC pipe, gasoline-powered pumps, water tanks, soil, bricks of coconut fiber, compost, etc.–and hide them discreetly. You can take a few things to the patch each time. Make these trips count; plan ahead.

Prevent the style, size, and sole pattern of your shoes from leaving discernible tracks that could lead thieves and cops to your patch. Your shoe print could be used as evidence against you if your patch is busted!

Camouflage plants by bending, pruning, or splitting the stem down the middle. Bending branches is the least traumatic and has more subtle effects on hormones, liquid flow, and physical shape. See "Pruning and Bending" in Chapter Three. You can split the main stem (and the plant) down the middle and stretch the halves horizontally to create an espalier. Pruning produces the strongest effect because it removes the high concentrations of hormones in the terminal buds and stimulates lateral growth. Pruning several main stems may make the plants less obvious but does not improve harvest. Think carefully about desired outcome before cutting.

Grow in sticker bushes or other unpleasant foliage such as poison oak, poison ivy, stinging nettles, etc, to discourage intruders. Look for bushes that are dense and high enough to shelter the patch from view. This deters large animals or people from wandering into the site. Protect yourself from these plants with a slick rain suit and gloves. Wash after each visit to remove irritating toxic oils and thorns.

Some growers plant where there are a lot of mosquitos or wasps, and at least one grower I know plants near a skunk's den. The pungent spray keeps people and animals at bay.

Some growers climb 30 feet or higher up into

the trees to plant on stands in the canopy or use deer and elk stands as growing platforms.

Set up a pulley system to lift large containers and potting soil up to the platform. Install an irrigation hose from the base of the tree up to the planting area and arrange around the pots so you can perform weekly watering with a battery powered pump rather than climbing the tree. Find a partner to stand lookout when you are working in the canopy, and be sure to use safety lines. Do not overextend yourself. I used to climb trees for a living, and my hard and fast rule was to spend no more than four hours climbing per day. When you get tired, accidents happen. If you hurt yourself, you will not be able to care for your plants!

Rig up a backpack so that it is easy to carry many clones.

Drought Growing

If you do not have access to a water source, dry land crops are possible if the area gets at least one good rain every one to four weeks.

In general, *sativa* strains have a bigger root system than *indica* strains and are more drought resistant.

Plants pull water and nutrients from the soil. Acceptable soil will hold one inch (3 cm) of water per one square foot (30 cm^2) of area and grow a plant seven- to eight-feet (2.1 to 2.4 m) tall with roots five feet (1.5 m) across and six feet (1.8 m) deep. Insufficient water results in small buds. A five-foot (1.5 m) plant may produce only one to six ounces (30-180 gm) of smokable bud. By contrast, a plant in good soil with ample water will be more robust and yield two to ten times more than those in poor soil, making attention to soil and water quality essential.

An easy, inexpensive way to feed and water your plants is to cut a 3/16-inch (5 mm) hole in the bottom of a five-gallon (19 L) bucket and fill with water and water-soluble fertilizer. Place one bucket by each plant with the hole oriented near the stem. Buckets should be refilled every ten days during the hottest weather. You will be able to get through the summer with as few as four to six buckets of water. This is very

Remove the lower leaves on spindly seedlings and plant deep.

This seedling will develop roots along the subterranean stem in a few weeks.

Remove male plants as soon as they are distinguished.

Beautiful outdoor harvest is drying in a remote concrete pump house.

Beautiful Spanish guerilla garden is close to harvest.

inexpensive and the extra water and nutrients will really pay off when it is time to harvest.

Planting and Maintenance

Start clones in rockwool, Jiffy, or soilless grow cubes for three weeks, and then transplant into four-inch (10 cm) pots of organic soil mix. Water transplants heavily to encourage root growth. Grow under an HID or CF lamp for two weeks. Harden-off before moving outside into the garden or secret garden.

One grower I know keeps a stream of plants moving from indoors to his outdoor gardens. He plants the first crop of clones in three-gallon (11 L) pots in a greenhouse, hardens them off, and moves them to their final location. The second crop is moved into the greenhouse when the first crop is moved out. He repeats this process three to four times during the season.

A complete low-maintenance setup is the goal for most guerilla growers. Loosen the soil, amend it, and throw in a handful of polymers to retain moisture. A thick layer of mulch, early in the year, will attract water, keep the soil cool, and prevent evaporation. Bury clones deep in the ground to promote a deep root system that will not require a lot of additional water.

Some growers transplant one-foot (30 cm) tall clones with smaller root systems by removing the first few sets of leaves and burying the root ball deeper with only six inches (15 cm) of foliage left above ground. Roots will grow along the underground stem in a few weeks. Deep roots will create more self-sufficient plants. This is of particular importance in extremely remote areas that are hard to get to and in the mountains where the rainfall may be sporadic.

Pest prevention is crucial for guerilla crops, because the patch is too difficult to maintain every day or week. It is easier to keep pests from attacking plants in the first place than to try and do damage control later.

Water and fertilize as needed. See chapters in this book that pertain to specific outdoor needs.

Harvest

Harvest before cold, damp, autumn weather sets in. This weather causes fungus–*botrytis* (bud mold) and powdery mildew. Many plants can take a short mild freeze (30-32°F [-1-0°C]). But if the temperature stays below freezing for more than a few hours, it could kill plants. Pay close attention to weather forecasts and apply the information to the microclimate where your plants are growing. Be ready to harvest quickly if weather dictates.

Law enforcement can force a harvest, too. Limit potential discovery by hunters, hikers, and cops by harvesting at night. Find out when police or rangers are in the area, and plan to be there at a different time. Police scanners that pick up local police activities can come in handy for determining their location.

Take a sharp pocket knife and a backpack to haul your crop incognito. If you are harvesting more than one variety, put them in separate bags or wrap in newspaper before they go in the backpack.

Determine a believable story to explain your presence in the area, including proximity to the garden, should you be discovered. Offer nothing, explain little, and keep it simple so you don't slip. Always remember Bart Simpson's words, "I didn't do it. Nobody saw me. You can't prove a thing!"

Check Chapters Five and Six for more information on flowering and harvest timing.

Note the small white pen next to the trunk of this 8-month-old 'Thai' plant ready for harvest.

You can use any transparent container to protect plants from cold. Always make sure they have a little ventilation.

Extending Seasons

Many products protect plants from cold weather and high winds, allowing growers to cultivate earlier and later in the year than would normally be possible.

The easiest and most cost-effective approach to extending the growing season is to locate and take advantage of microclimates such as areas that warm up faster or retain heat longer. Orientation to the sun, wind breaks, and walls made out of materials–bricks, mortar, stone–that will hold the heat and can even pre-

To make a cloche, cut the bottom out of a plastic milk container and remove the lid for ventilation.

A Wall O' Water will keep plants warm when temperatures freeze.

vent freeze-thaw cycles all play a part in evaluating microclimates.

Dark rocks can moderate temperature in a very small area by soaking up the heat of the day then releasing it slowly as the evening temperature cools.

Dark walls and soil will absorb and hold more heat than their light-colored counterparts. Or use plastic mulch which will shade weeds, prevent moisture loss, and raise the temperature of the soil by 5-15°F (3-8°C) on a sunny day. As plants grow, the leaves will shade the plastic and stop the warming effects.

A lake, pond, or small creek will also moderate air temperature, keeping it warmer in winter and cooler in the summer.

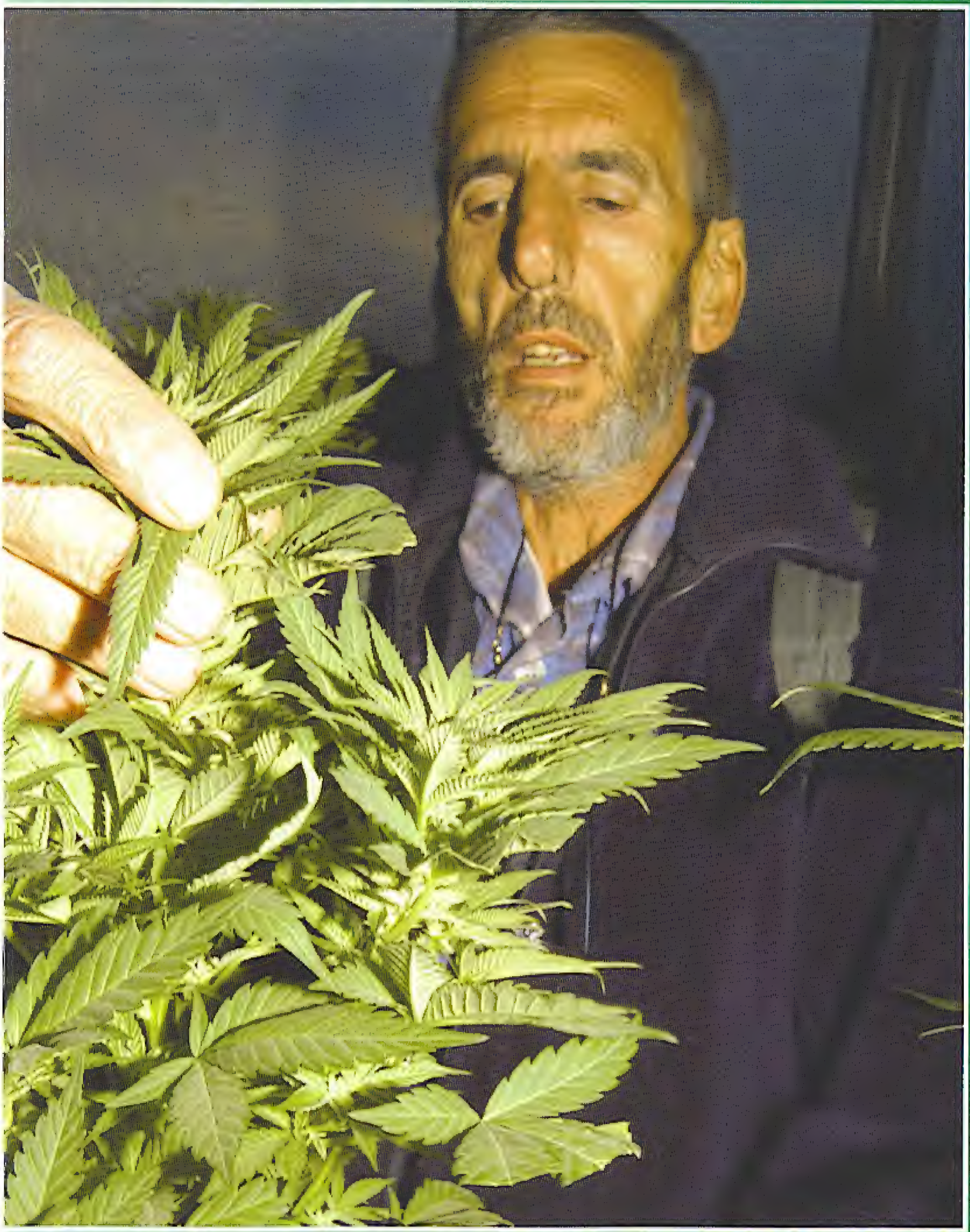
Cloches are individual protective coverings that keep plants warm at night. A simple cloche is a milk container with the bottom cut off and the lid removed. Placed over a plant, the plastic will capture and retain heat while allowing ventilation through the open top. You can make cloches out of wax paper, glass, and jars, or buy them. Commercial units are made of rigid transparent plastic or heavy-duty wax paper. They are easy to use and stack well for storage.

The Wall O' Water is a plant life-saver. It is a water-filled teepee which uses the heat-emitting properties of water to shield plants from excess heat and keep them warm in the cold. It holds three gallons (11.5 L) of water and fits over the plant. During the day, the water absorbs the heat of the sun, moderating the temperature inside the teepee. At night, as the air temperature drops, the water releases its heat, keeping the plant comfortable. The Wall O' Water does its best work in the spring when there is still a chance of freezing. As water freezes, it releases more heat into the teepee and can protect plants down to 20°F (-7°C).

Covers protect early plants and can help produce a spring crop. The most uncomplicated cover is a sheet or blanket spread over the plant and held down with stones or soil. A low wattage electric light bulb carefully placed under the cover will raise the temperature 10-15°F (5.5-8°C) above that of the rest of the garden. Be very careful that the light bulb does not touch any part of the cover, or it may start a fire. Products such as Agronet™ and Reemay™ are spun-fiber with sun-protection properties that can be used as covers in place of the sheet or blanket.

Row tunnels can be made of clear corrugated fiberglass that is bent into an arch and secured over the garden. Commercial row covers come in many sizes from large enough for dwarf fruit trees to smaller units for pepper plants and rose bushes. Those made with polypropylene will protect plants down to 25°F (-5°C).

Chapter EIGHT
CASE STUDY & GARDEN CALENDAR



Inspect plants carefully every day.

Case Study - Energy Efficient Organic Sea of Green

Growing Statistics

Yield 1: 8.4 pounds (3.8 kg) in ten weeks, initial grow in room half the size of other grows.

Yield 2: 27.6 pounds (12.5 kg) in nine weeks for second grow.

Yield 3: 30.2 pounds (13.7 kg) in nine weeks for third grow.

Cost: First Crop / Initial setup + power: USD $5647 (Eur $4500) - USD $672 per pound (Eur $1184 per kg)

Second Crop / Improvements + power: USD $8220 (Eur $6550) - USD $298 per pound (Eur $524 per kg)

Third Crop / Reap the rewards: USD $1882 (Eur $1500) - USD $62 per pound (Eur $106 per kg)

Space: First grow: 16' 5" × 7' 10" (5 × 2.4 m), **Second and third grows:** 33' × 7' 10" (10 × 2.4 m)

Watts: First grow - 6000 watts, second and third grows - 8400 watts.

Cloning: 100 clones (first crop) and 400 clones (second and third crops) purchased from an outside source and ready for planting. Clones were purchased for USD $3.15 each (Eur $2.50 each). The strain supplied was Power Plant.

Vegetative: First crop - 100 clones were planted directly into flowering room and given 18 hours of light per day for a period of 14 days. For the second and third crops, 400 clones were used. Because the number of plants grown per square meter was doubled, only seven days of vegetative growth were needed pre-flowering.

Flowering: The young plants, when acclimatized to their new home and growing well, were switched to a 12-hour light cycle for eight weeks.

Harvest: Mature plants reached an average height of 23 inches (60 cm) with multiple branches.

Nigel & Terry

THE First CROP :-

Nigel and Terry lived together in Central London and worked for the same large British company. When both were offered a transfer to a new firm in Holland, they jumped at the chance. The new company was in the west, near the coast, and in close proximity to some picturesque rural districts. They rented a house in the countryside where they could enjoy the solitude and reduce the stress associated with corporate life.

The house they rented was on a large piece of land, not in direct view of any neighbors. Near the house was a big shed once used to service farm equipment. It had power, water, and a functioning toilet and shower. Interesting?

After settling in at work and making the house comfortable, Nigel and Terry got to thinking. "That shed's just sitting there empty, and wouldn't it be just perfect for a hydro setup?" As it turned out, the property they rented was owned by an elderly woman who lived in Belgium. The rent was paid to a real estate agent in town, and no neighbors had even spoken to them in the six weeks since they moved in, so they figured the place was pretty safe. After a few nights sitting up and discussing their prospects, the lads decided to capitalize on their good fortune, and "go for the grow!!"

At the back of the shed was a storage area that had been partitioned off from the rest. It spanned the entire width of the building, about 33 feet (10 m) and was approximately 10 feet (3 m) wide. This seemed like an ideal place for the new project, but a few questions arose. Exactly how big were they going to make this thing? How much cash were they willing to invest? What were the consequences of success versus failure, or worse, discovery? Being corporate minded, the lads decided to make an executive decision. Seek advice from a professional.

Holland is world-renowned for its indoor weed production; consequently, grow shops are abundant. Nigel and Terry found the staff at their nearest "grow-op" to be open, professional, and well equipped to deal with their specific inquiries. After an enlightening chat, the boys decided to play it safe and use only half the area of the storage room 16 feet 6 inches × 10 feet (5 × 3 m). They figured that organic was the way to go, and the simplest growing method (pots and soil) would be best for starters.

They bought enough timber and other materials to construct two benches 16 feet 6 inches long × 4 feet wide (5 × 1.2 m). They bought 100 5-liter plastic pots, ten 50-liter bags of premixed organic potting soil, and enough white, laminated wooden paneling to cover the walls (approximately 36 sq ft [30 sq m]). The idea was to construct the basic room, fill the pots with soil, place them on the benches, and check that the design was solid before progressing further. All went together fine and strong, total expense USD $780 (Eur $620).

Next they purchased ten complete 600-watt HP sodium lighting kits (lamp, ballast, reflector), a Hagar multi-output electrical control board with built in timers, a Torin 3200 cu/hr inline fan, an xyz carbon filter, two pedestal fans, some organic xyz nutrient, and 100 clones. Total expense USD $4405 (Eur $3500).

This system was relatively easy to set up. The inline fan was installed high up on the rear wall. Its job was to expel hot air from the grow room and create enough draw to pull cool air in through a vent (large gap) between the opposite wall and the grow room floor. When and if smell became a problem, the carbon filter could be connected to the Torin and its fan speed increased to maintain constant odor-free airflow. The two pedestal fans would be incorporated to increase air movement but not until all else was set up. The lamps were arranged to cover an area of approximately 3 feet 3 inches × 3 feet 11 inches (1.0 × 1.2 m) each. The reflectors supplied with the lighting kits were cheap, half-octagon, aluminium horizontal hoods. However, they were

lightweight and seemed very bright when the lights were turned on.

Clones were potted and placed on the benches (ten under each lamp). For the first five or six days, the lights were kept about one meter above the plants, then gradually lowered to about half that height as growth became healthy and vigorous. Watering was done by hand, and because the soil was a premixed organic blend, no extra fertilizer was added for the first week.

Nigel and Terry hovered over this first crop like proud fathers. They adhered to a daily schedule of watering, monitoring pH, and inspecting leaves for signs of insect attack and nutrient imbalance. As a result, the plants developed quickly and were ready to begin flowering by the end of the second week. To induce flowering, the lights were set back from 18 to 12 hours per day. About this time, they began to add organic nutrient supplements to the daily soak. As the plants developed further, they worked up quite a thirst; all pots were watered until their individual drip trays nearly overflowed.

The carbon filter was connected around week 6, in an effort to prevent odors escaping the shed. This tactic worked well, but it reduced airflow. As the plants increased in size and density, it became increasingly difficult to keep grow room temperatures below 86°F (30°C). On a couple of occasions, the temperature rose above 91°F (33°C), and bud development definitely suffered. The guys remember one time when every plant stopped growing for three or four days after the room overheated.

As their crop approached maturity, Nigel and Terry noticed something strange going on. Most plants were finishing off nicely, but some (generally the biggest) didn't seem to be maturing properly. The buds on the plants growing right under the lamps were big but didn't seem as solid or as resinous as those on the other plants. This condition became more noticeable as time progressed. By the 8-week mark, the larger plants started to go a bit yellow and drop leaves. It was time to pull the pin on this caboose!

The crop was harvested a few days later and hung to dry. In general, the smaller plants produced better quality buds than the larger plants. The yield was 8.4 pounds (3.8 kg) of very nice weed, and with that in hand, who was going to complain?

Actually, the boys were very happy with their first result, as everything ran quite smoothly. They had a few problems with heat, but they learned a lot and gained the confidence (and the $) to expand their room to its full potential, 33 feet × 10 feet (10 × 3 m).

THE SECOND CROP:-

This was a time of change and serious improvement. Over the past three months, Nigel and Terry had visited the local hydro store on many occasions and had struck up a friendship with one of the owners who worked there. He had given them heaps of useful advice, and the boys realized that without his input, the first crop could have easily ended in failure.

The storeowner (we'll call him Bob) offered to help the boys design their new double-sized room, provided they purchase all their new equipment from him, of course. He insisted that the system they were currently running used too much power, generated too much heat, and was too labor-intensive to be successfully doubled in size and maintained by two guys already working full-time jobs. As usual, Bob was talking sense, so Nigel and Terry decided it was a safe bet to play it Bob's way and part with the necessary cash. The total cost of Bob's proposed improvements weighed in at USD $7552 (Eur $6000). Calculating at a rate of Eur $2200/kilo, the first crop paid for itself and more than half the expenses of the proposed expansion and improvements. Cool!

Bob's plan was to: 1) Double the length of the existing two benches and line the walls of the other half of the storage area with white laminated wood; 2) Set up an automatic watering system with a large reservoir to reduce manual

labor; 3) Plant double the amount of clones per area to reduce time in vegetation by a week; 4) To achieve adequate air flow, install a new 5000 cu/hr fan for air extraction, and use their existing 3200 cu/hr fan for air intake; 5) Make use of current advancements in reflector technology to decrease the number of lights required–from 20 to 14–and consequently reduce the power usage and heat generation by the same ratio; 6) Bob also suggested ditching the pot idea in favor of cocopeat slabs. "Just supply the plants with a top-quality organic nutrient, and the garden will be state-of-the-art and organic."

The best way to explain the setup is to refer to Plate C. The room was set up pretty much as Bob had planned. Five Danish-made plastic 6 foot 6 inch × 3 foot 3 inch (2 × 1 m) trays were loaded up with coco mats and placed on each 33 foot (10 m) long bench top. Each tray was installed with a 3-degree tilt to promote drainage. An elaborate system of drippers and drainage pipes was constructed and each bench was run as a separate entity with its own 400-liter reservoir and 6000 L/hr pump. Both pumps were timed to run x times a day for y minutes, and nutrient runoff was pumped out of the grow room and into the shower drain.

The fans were installed placing the 5000 cu/hr fan high at one end of the room and the 3200 cu/hr fan down low at the other. The 5000 removed air via the vent in the upper central part of the room. The vent was box-shaped and permanently connected to the carbon filter. When the filter was not required, a cover on the under side of the box was removed, and air was drawn out through the exposed opening. The 3200 forced cool air through ductwork that ran along the floor under each bench. This air entered the room in four places under each bench, equally spaced along their length. Four pedestal fans were used to mix the air and push it in the general direction of the outlet vent.

The room was lit using fourteen 600-watt lamps, each covering an area of 4 feet 8 inches × 3 feet 11 inches (1.43 × 1.2 m). This was achieved by using high-tech adjustable double-parabolic reflectors (Adjust-a-Wings). These flexible "wings" were highly reflective and could spread light evenly and broadly at a range of heights above the plants. They were rated to cover areas of 4 feet 11 inches × 4 feet 1 inch (1.5 × 1.25 m) and above with 600-watt lamps, so 4 feet 8 inches × 3 feet 11inches (1.43 × 1.2 m) was within prescribed limits. Another lighting product was used in conjunction with the wings and referred to as a Super Spreader. These fit below the lamp and spread excess light and heat from that hot area across the light's entire footprint. They allow lamps to be close to plants to produce rapid growth but keep growth rate and plant size even.

When compared to the first, this crop almost seemed to grow itself! The irrigation system alone (reservoir size, how many days reserve, nutrient dosing, the coco/Danish tray/run to waste system) saved Nigel and Terry about two hours a day.

The ventilation design combined well with the simple, effective lighting strategy. Air was pumped in and pushed up from below, cooling plants and lights on its way up. The heated air would rise naturally, be trapped by the ceiling, sucked towards the vent/filter, and exhausted from the room. With a small amount of adjustment, the air temperature could be maintained at 80-82°F (27°C to 28°C) even when the plants formed a dense mass across the whole room.

The wing reflectors could be adjusted to provide even lighting when they were close to the plants (growth and flowering phases) and when they were farther away (early vegetative and final maturation phases). When reflectors were hung low over the plants, the spreaders dealt with any hot spots and insured even lighting.

Nigel and Terry's second crop grew vigorously and evenly all the way through to maturity. They had a small problem early on with spider mites. Seems the clones they bought had a few mites onboard. The mites were dealt with organically and effectively. Bob had suggested the boys use

Ecolizer organic nutrients and follow their program exactly. The program suggested misting clones regularly with their "Bugs Away" foliar feed. This solution contains nutrition plus essential oils that coat mite eggs and suffocate them. No chemicals and it worked!

After a total of nine weeks growing, the room was filled with plants that formed a dense layer of evenly developed, sticky, fat bud. The room resembled a "sea of green" rather than a collection of plants of assorted size and shape. As they harvested, Nigel and Terry joked about mowing down a mass of sticky green corn cobs. Cutting, hanging, drying, and particularly manicuring this much weed was one hell of a job and took them a month to finish. The final yield was 12.5 kilos and the quality was A+.

At this point, the boys had covered all their expenses, they were almost half way into their third crop (which was growing strong), and were already 10 kilos in the black. This had been an ambitious project. Nigel and Terry had not achieved success without significant risk and a lot of hard work! Guess who was planning a well deserved "holiday in da sun"?

Comparing Statistics:

First Crop, 8.4 pounds (3.8 kg) / 6000 watts = 0.02 ounces (0.63 g) / watt

8.4 pounds (3.8 kg) / 14.4 square yards (12 m sq) = 11.1 ounces (316 g) / m sq

Second Crop, 27.6 pounds (12.5 kg) / 8400 watts = .05 ounces (1.49 g) / watt

27.6 pounds (12.5 kg) / 28.7 square yards (24 m sq) = 18.4 ounces (521 g) / m sq

– Bob's advice helped the boys increase their power efficiency (g / watt) by 137 percent.

– Bob's advice helped the boys increase their space efficiency (g / m sq) by 65 percent.

– Bob's da man!

Calendar and Checklist

A calendar helps growers know what to do and when to prepare to do it. A checklist adds necessary routine to the process. The calendar outlines the average three-month life cycle of clones. It notes major points of interest during each stage in life. The weekly checklist consists of a few things that must be done every week to ensure a successful crop.

Savvy growers read and consider each and every point on the calendar weekly. They mark each point with a check when finished with it.

Growers should spend at least 10 minutes per day, per lamp, to have a productive garden. This is enough time to complete all the stuff on the weekly calendar. Much of gardening is simply watching and paying attention, but it takes time to have a decent, productive garden. If using CO_2 enrichment or hydroponics, allow 20 minutes per day for maintenance.

Large chunks of time will be spent setting up the grow room and harvesting. These are not included in the 10-20 minute daily schedule.

Calendar

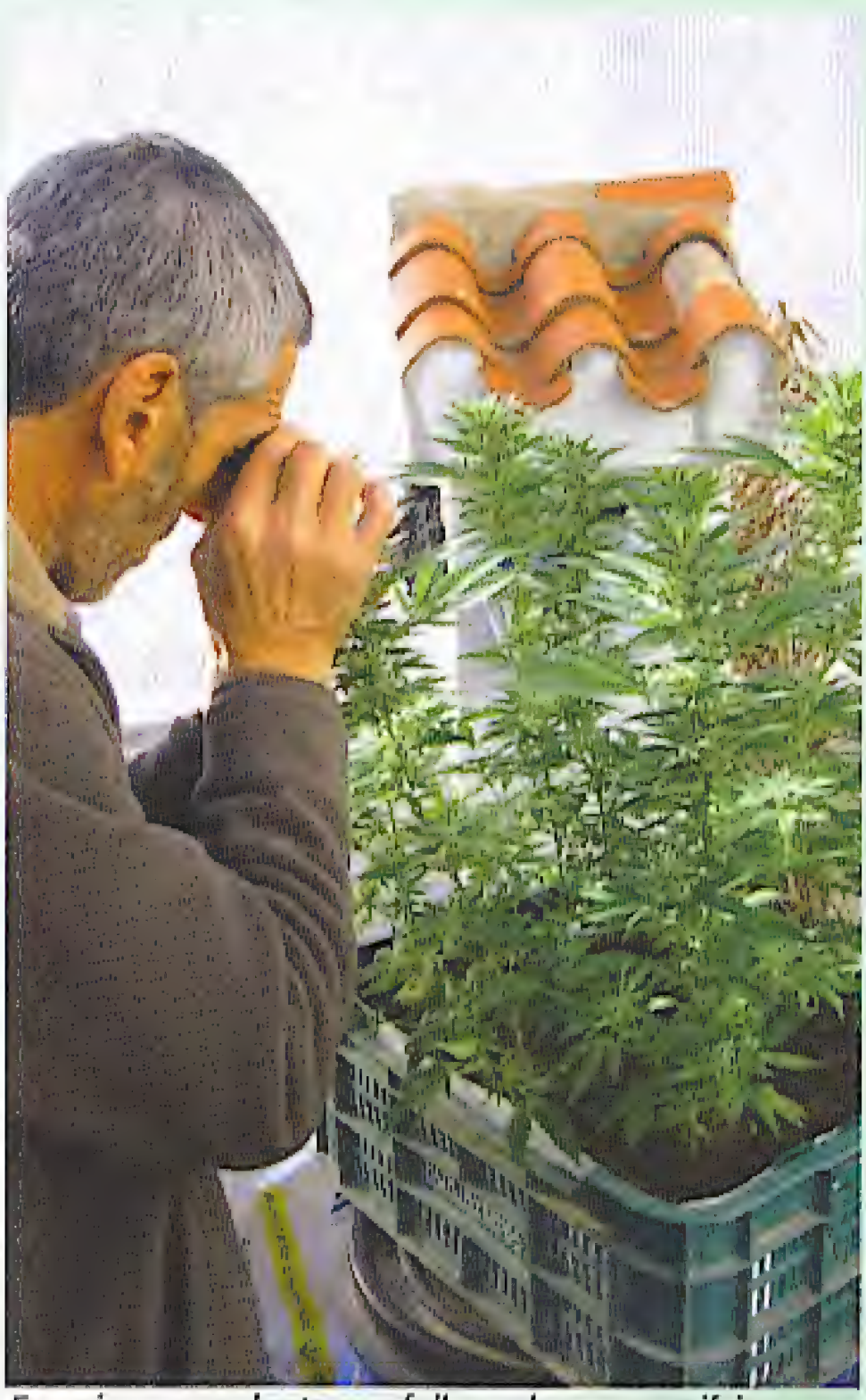
The calendar starts on January 1st and is only three months long. Two weeks for clones to stick (root), two weeks of vegetative growth, and eight weeks of flowering. This indoor calendar can be started any day of the year, no matter which direction the wind is blowing or what the weatherman says.

If the garden is full of clones grown with CO_2 enrichment or hydroponically, the calendar could move up one week, depending on how fast the garden grows. Remember, light intensity substantially diminishes over four feet away from the bulb.

Weekly Checklist

Check the following to see if they function properly:

Air ventilation
Air circulation
Humidity: 40-50 percent
Temperature: day 70-75°F (21-24°C); night 55-60°F (13-16°C)
Soil moisture (dry pockets) water as needed
Cultivate soil surface
Check pH
Rotate (turn) plants
Check for spider mites under leaves
Check for fungi
Check for nutrient deficiencies
Regular fertilization schedule
Check HID system for excessive heat at plug-in, timer, ballast, and near ceiling
Cleanup!
Cleanup!
Cleanup!
Check walls and ceiling for mold
Move lamp up, 12-36 inches above plants



Examine your plants carefully under a magnifying eyepiece to see if they are ready for harvest.

First Month

January 1st, First Week

Take clones and root clones. They root in 1-4 weeks.

Sow seeds. Make sure they are warm for speedy germination.

Mix dolomite lime into soil before planting.

Prepare grow room. Read "Setting up the Grow Room" and "Setting up the Lamp."

Set timer for 18-hour days and 6-hour nights.

January 15th, Third Week

Make sure the vegetative room is perfect before bringing in the clones.

Move in rooted clones or sprouted seedlings, place 24-36 inches under HID. Keep soil surface moist.

Fertilize seedlings and clones. Use an ALL PURPOSE fertilizer. Start regular fertilization schedule.

Special care should be given to soil. Moisture damping-off and dry soil pockets could stunt plants now!

Grow rooted cuttings under metal halide light.

Take cuttings from strong mother plants.

When vegetative plants are big enough, induce flowering.

Second Month

February 1st, Fifth Week

Vegetative plants should be 6-12 inches tall with broad, firm, green leaves.

Continue regular supplemental fertilization program.

Move HID 12-36 inches above month-old seedlings and clones.

Thin and transplant seedlings into larger pots.

Irrigate as needed.

February 15th, Seventh Week

Move vegetative clones into 12-hour flowering room.

Change to super-bloom fertilizer.

Plants should be 12-24 inches tall.

No leaves should be yellowing. If they are, fine-tune the weekly checklist.

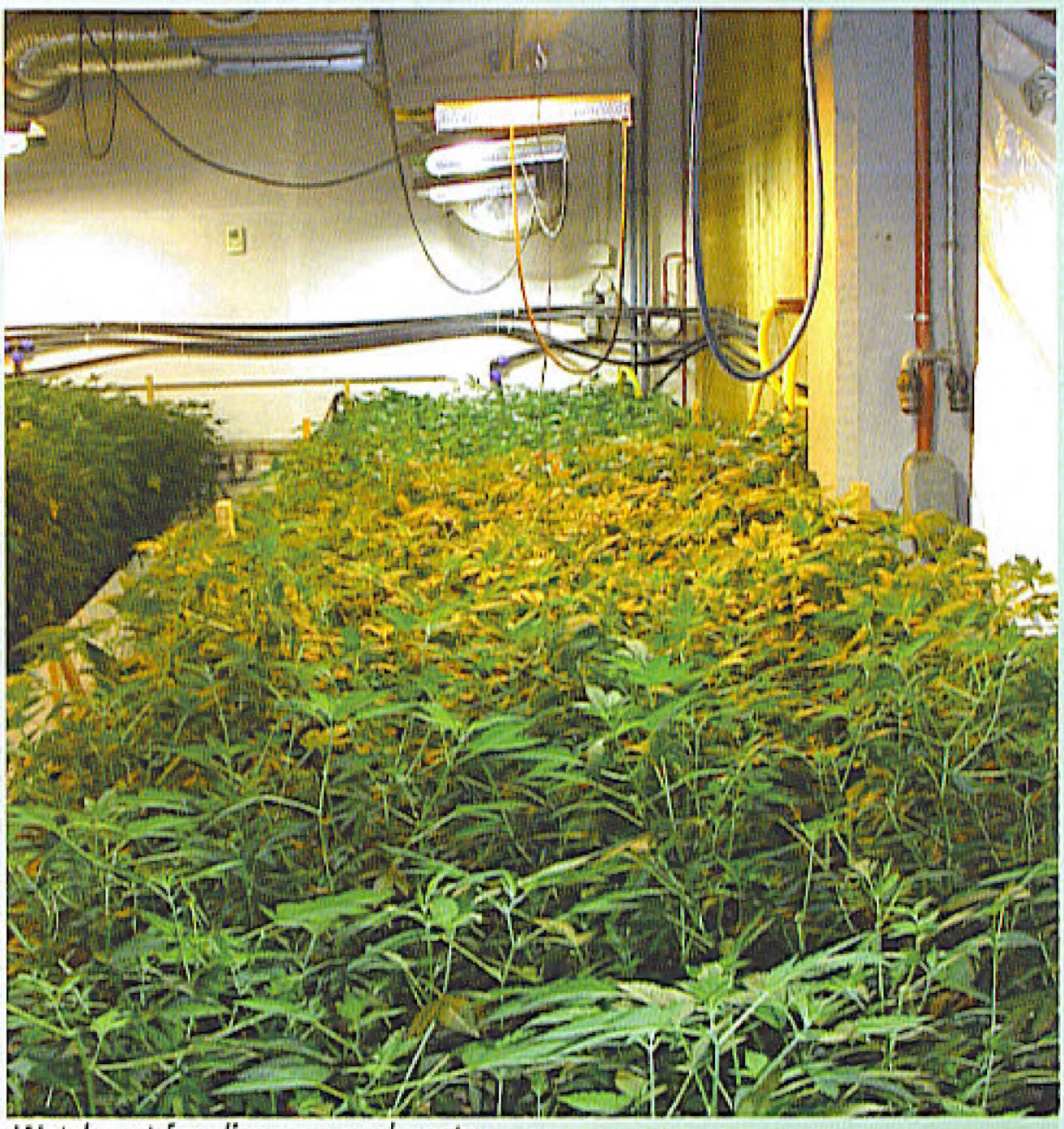
Over-watering is sometimes a problem now. Check the soil with a moisture meter.

Increased air circulation and ventilation are essential.

Mist the garden with water to wash leaves.

Iron, magnesium, and nitrogen deficiencies could show up now.

Supplemental trace element mix should be applied.



Watch out for diseases and pests.

Plants need plenty of light to flower well.

Continue to water and fertilize your garden.

Third Month

March 1st, Ninth Week

The plants are two months old and 18-36 inches tall.

Females should dawn white, hair-like pistils.

Male pollen sacks develop. Remove or save males for breeding.

Take clones for the next crop.

If there are any leaves yellowing and dying, fine-tune the weekly check list.

Air circulation, ventilation, and relative humidity are very important now!

Leach soil to wash away any excess fertilizer salt residues.

Seedlings only two-months old should be given another month of growth before flowering is induced.

Cloning for sex may now be practiced.

Soil will dry out rapidly now; watch for dry soil pockets.

Bend and tie plants over to give garden an even profile.

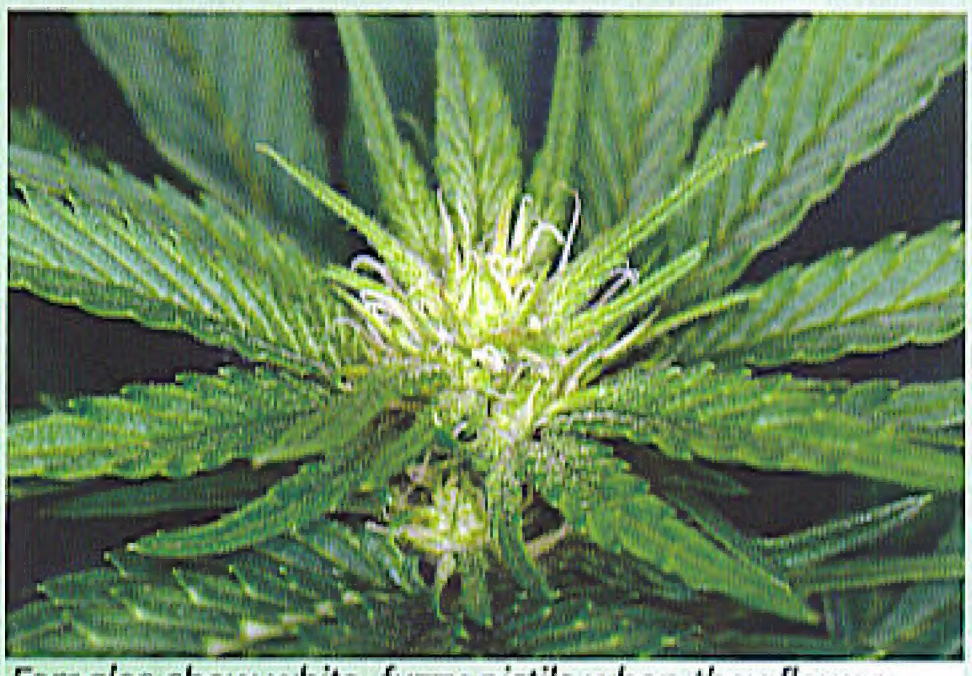
Prune plants that are shadowing other plants (optional).

Heavily planted rooms should be ready for a second lamp. Add another lamp to increase harvest.

This is the time of peak THC production. During the next one to four weeks, the tops will double in size and potency!

Lower leaves may yellow. If many leaves are yellowing, fine-tune the checklist.

After fine-tuning checklist, remove yellowing leaves only if they are clearly going to die.



Females show white, fuzzy pistils when they flower.

Plants grow tall as they reach for the light.

Garden might still be using quite a bit of water; make sure to check it daily if needed.

This is the last chance for spraying and fertilizing, if you plan to harvest within two weeks. If there are any nutrient, fungi, or insect disorders, this is the last chance you will have to use sprays to combat them.

March 15th, Eleventh Week

Tops elongate, making the garden's profile about 6-12 inches taller than two weeks ago.

Continue fertilizing with a high-bloom fertilizer.

Older leaves may start to drop a little faster, due to decreased nitrogen in the super-bloom fertilizer or if only an HP sodium lamp is used.

Inspect for bud (gray) mold.

Check all factors listed on the checklist.

Buds should be oozing with resin by now.

Some shade-leaf yellowing is normal.

Indica and early-maturing buds are nearly ripe now. Harvest if ready.

Water as needed.

No insecticides!

No fungicides

No fertilizer!

Check for bud blight or bud mold.

Fourth Month

April 1st, Twelfth week

The only change will be in growth of more and heavier calyxes on the flower buds.

Continue to water as needed.

Bud (gray) mold could become a problem. Constant scrutiny is a must! It shows up overnight, so watch out!

Everything should be ready for harvest by now. If it is not, consider growing an earlier-maturing strain of cannabis.

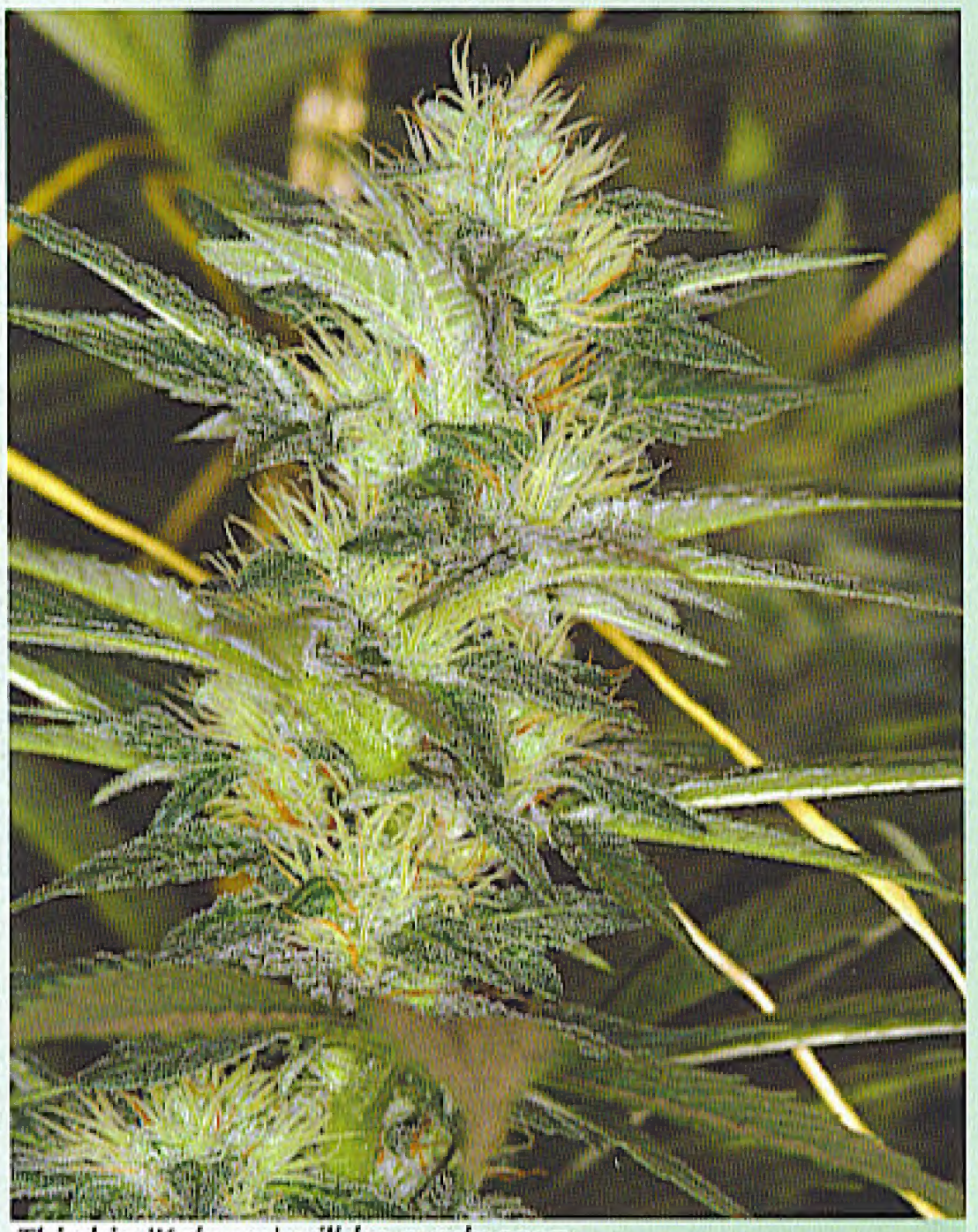
Harvest now or within a couple of weeks.

THC content is on its way downhill when resin glands turn amber.

Let "seed crops" go until the seeds are big and healthy before harvesting.

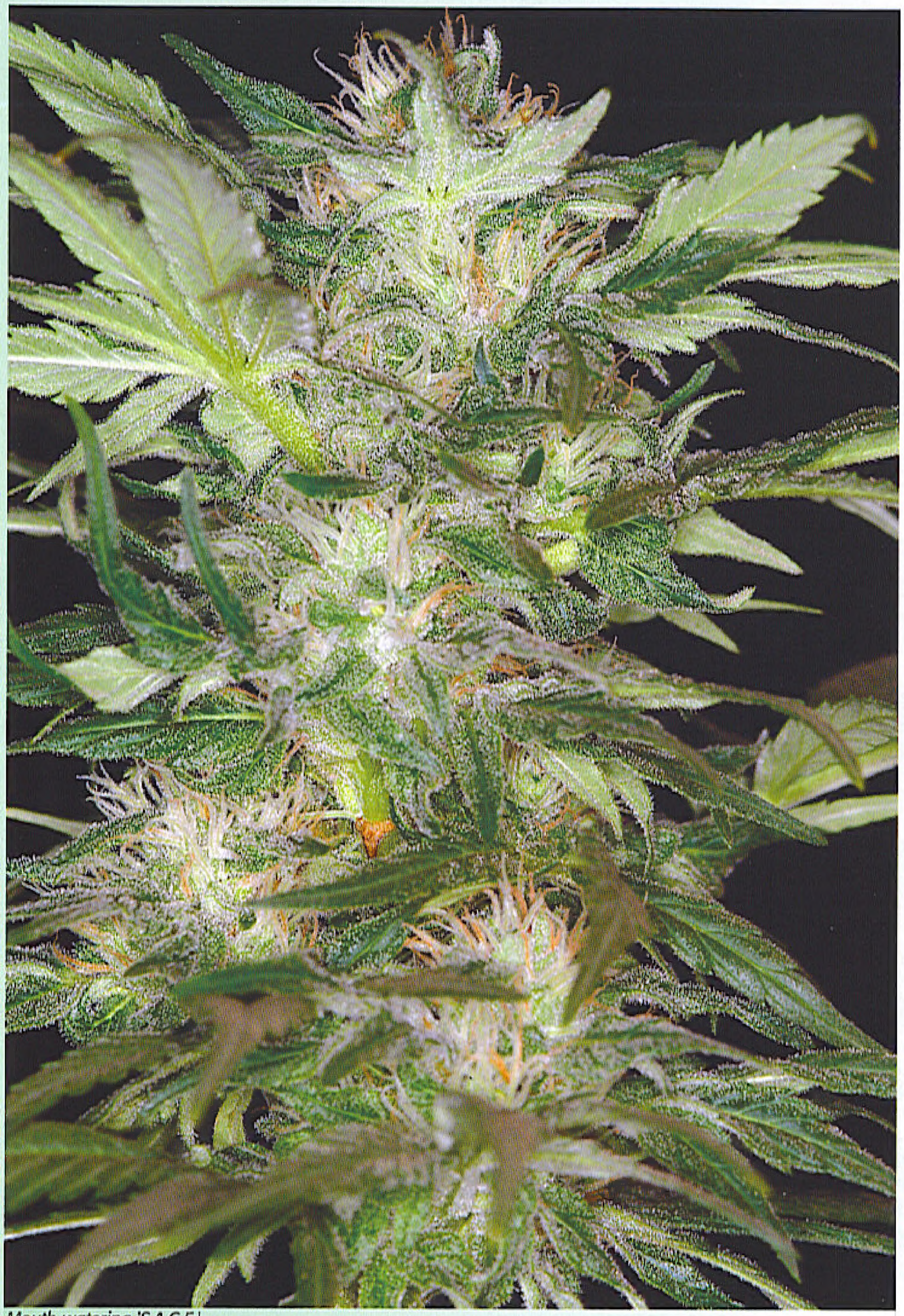
Harvest and clean up.

Move in rooted clones for next crop.



This big 'Kahuna' will be ready soon.

Huge buds adorn this garden a week from harvest.



Mouth-watering 'S.A.G.E.'